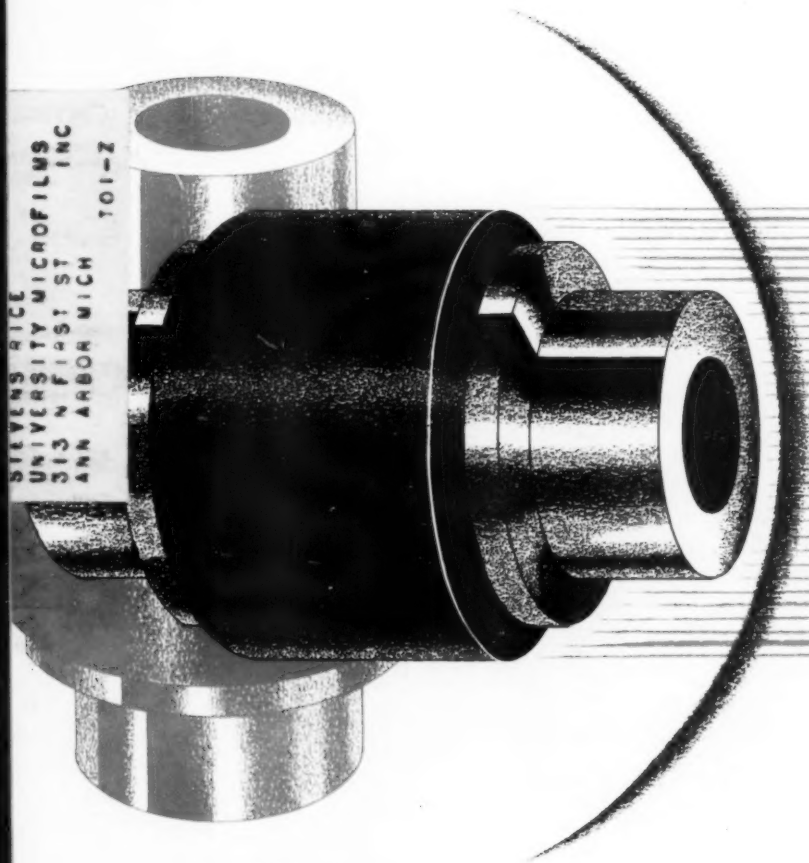
# POWER TRANSMISSION DESIGN

APRIL 1961

INCLUDING BEARINGS DESIGN/APPLICATION




## FLEXIBLE COUPLINGS

- Selection
- Application
- Buyer's Guide

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Can a patent help YOU?
Rough trip for a Corvair transmission

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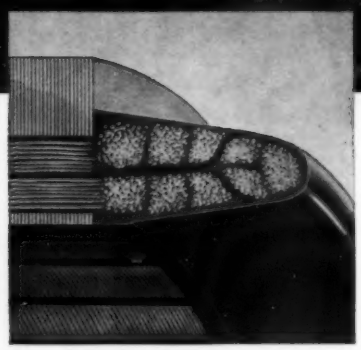

Note complete coverage and protection provided by molded end-turn construction.

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*give you three mighty advantages*

### 1 SMOOTH, SLIP-PROOF POWER TRANSMISSION

With belt teeth meshed in pulley grooves, Maurey Positive Drives are slip-proof as chain and gear drives. Maximum power moves to work smoothly, quietly, with uniform speed. There is no rise and fall of pitch line, no slippage, no creeping, no backlash. Here, in brief, is smooth, positive power transmission on heavy loads or the finest precision work.

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*SEE THE BEST OF THE NEW IN POWER TRANSMISSION AT THE MAUREY BOOTH*
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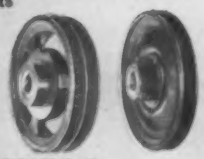
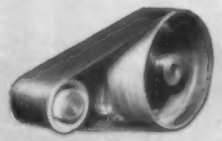
Mor-Grip V-Belts


Hi-Q FHP V-Pulleys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# Your local Moline Chain OFFERS MORE

## His engineering staff is capable of helping solve power transmission problems.

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## He offers experienced technical help to give you special service.

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## He maintains a diversified stock of power transmission equipment.

You'll save precious time when you call on your local Moline distributor for power transmission equipment. You don't have to shop around because he normally carries in stock components of every description. His inventory includes bearings, reducers, clutches, couplings, pulleys, takeups . . . virtually any item needed for efficient power transmission.

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Leaders for 60 years

*for conveying, elevating and power transmission*

**MOLINE MALLEABLE IRON CO., St. Charles, Illinois**

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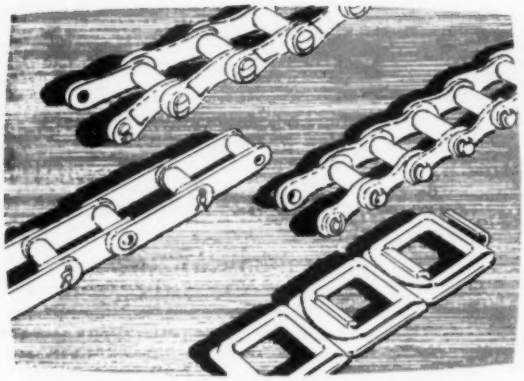
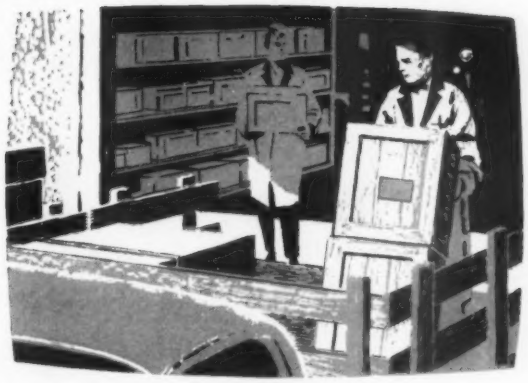


## He carries a large stock of Moline chains, sprockets and buckets.

Your Moline distributor can supply you immediately with chain, sprockets, buckets, sheaves and attachments for any industrial conveyor, elevating or power transmission application. He is always available for help when you need "specials" in malleable chain and attachments because Moline has long been a prime source for OEMs when special chain is required.



## He stands ready to give you immediate delivery from stock.

You can rely on fast service when you call your Moline distributor. Tremendous inventories on hand (many distributors stock up to 7,000 power transmission and conveying items) enable him to fill orders and have them on their way within 24 hours. So depend upon your Moline distributor for all your power transmission and conveying supplies and be sure of conscientious service and quality products.

## Call your local Moline Chain Distributor today!

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### . . . with standardized package design

Fawick Airflex Clutches and Brakes are easiest to use because they are incorporated into simplified *standard packages*, available in a wide range of sizes and capacities, and adaptable to all types of machines.

### . . . engineering assistance

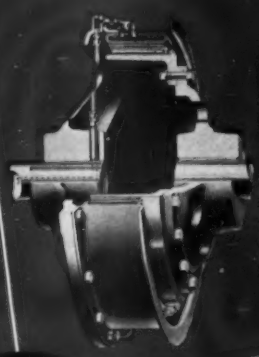
Fawick engineers, at the factory and in the field, are specialists in mechanical power transmission, ready to provide complete engineering service throughout all stages of design or modernization of machine drive systems.

### . . . and increased production through top clutch performance

Fawick power transmission packages provide a sure method to increase production, as proved in thousands of applications in all major industries. Their unmatched performance record is based on drum-type air clutch design which provides instantaneous response, low maintenance, automatic self-adjustment for wear and positive safety.

**FSPA (Fawick Standardized Press Application)**

This clutch and brake package is designed for power presses and other high-speed cyclic machines requiring precise control of single, continuous or inching operations. Package includes CB Airflex Clutch, self-energizing CS Brake, Timing Rotorseal and high-speed clutch controls. On presses in the 5 to 150-ton range, FSPA units may be crankshaft-mounted in combination with flywheel, or clutch and brake may be mounted separately. FSPA is available in 25 sizes with torque capacities from 2,040 to 172,000 in.-lbs. at 75 psi.



**CB Airflex Clutch**

Standard complete air clutch may be through-shaft mounted, or used as flexible clutch-coupling between shafts as shown. It compensates for both parallel and angular misalignment. Constricting type unit is designed for high-speed cyclic applications and general power transmission on all types of industrial machinery. It is available in 21 sizes with torque capacities from 2,040 to 1,130,000 in.-lbs. at 75 psi.

FAWICK controls best by AIR

**Standardized CB Package Application**

This small air clutch package may be through-shaft mounted on all types of cyclic machines having moderate power requirements. Tapered bushing construction in standardized bores and mountings simplifies installation and service problems. Package incorporates the CB Airflex Clutch, is produced in five sizes from 6 to 14-in. diameters, with torque capacities from 2,040 to 19,700 in.-lbs. at 75 psi.

**VC Ventilated Clutch**

Complete clutch package incorporates ventilated, constricting type clutch for extreme heavy duty applications involving high starting loads or sustained slippage. Rapid heat dissipation insures continuously high torque capacity. Unit may be through-shaft mounted or used as a clutch-coupling. Produced in both narrow and wide series, the VC Clutch is available in 14 sizes with torque capacities from 27,000 to 900,000 in.-lbs. at 75 psi.

*For more information on how Fawick can simplify* ***your*** *clutch problem, call your nearest Fawick representative or the Home Office.*

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INDUSTRIAL CLUTCHES AND BRAKES

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# POWER TRANSMISSION DESIGN

THE MAGAZINE OF MACHINE DRIVES

**APRIL 1961**

**volume 3 number 4**


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*Angular drives clustered in minimum space on stretch reducing mill operate at 8° 10 min. plus or minus.*

# ANGULAR DRIVE DESIGN

## *Now Made Easy with*

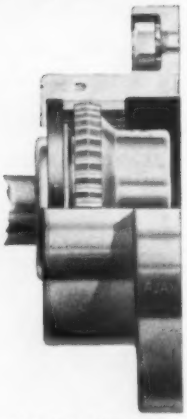
## AJAX Dihedral Couplings

When your design requires angular drives, the ability of Ajax Dihedral Couplings to permit angular and offset shaft alignment may offer a welcome answer.

The patented tooth design of Ajax Dihedral Couplings now makes possible smooth running angular drives in minimum space.

Double engagement and floating shaft types provide a wide range of adaptability to design requirements. Performance has been proved and approved in thousands of installations involving high torque, adjustability, weaving structures and other difficult conditions.

Feel free to draw on the broad experience of Ajax engineers and sales representatives to aid in working out your problems. Refer to the Yellow Pages under "Couplings" or phone or write...



Cut-away view shows typical arrangement of Ajax Dihedral gears specially designed for handling angular and offset shafts.

**AJAX FLEXIBLE COUPLING CO. INC.**

**132 Portage Road, Westfield, N. Y.**

***In Canada—The Alexander Fleck, Ltd., Ottawa***

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**POWER TRANSMISSION DESIGN**

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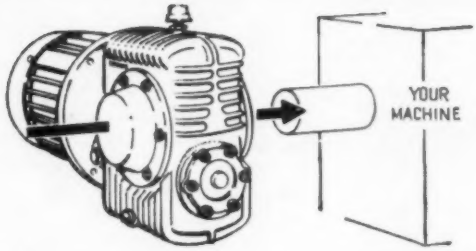
BPA

# CONE-DRIVE GEARMOTORS for "PLUG-IN" POWER

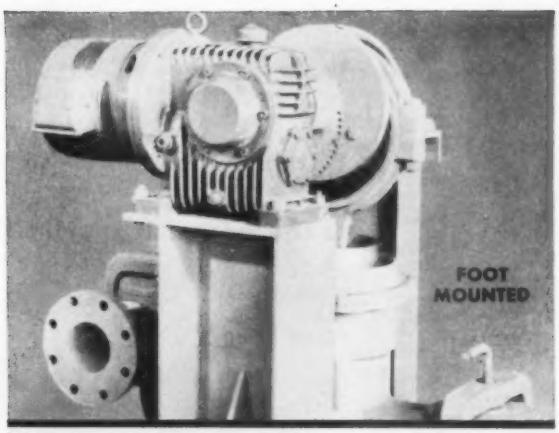


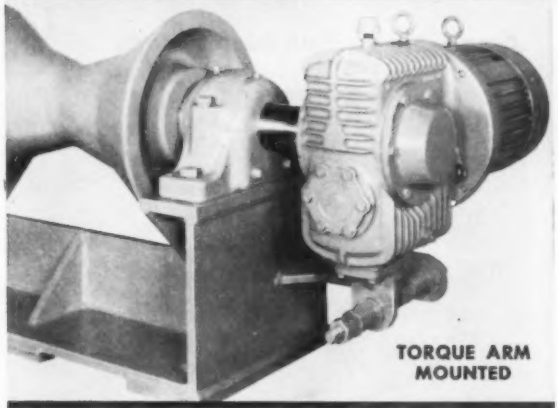

***Hollow-Shaft Speed Reducer-Motor forms complete power transmission package . . .***

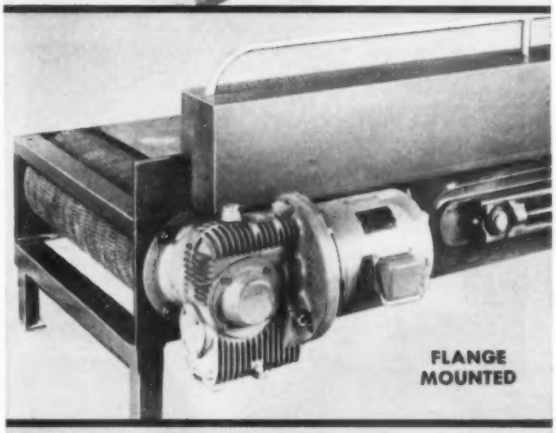
With the compact, right-angle Cone-Drive gearmotor the machine designer can make use of an integral drive package of nearly any required speed and horsepower. Twenty-seven standard output speeds from 7.3 to 525 RPM (with 1750 RPM motor) are available in models from ¼ to 40 horsepower. Gearmotors can be specified with hollow shaft for mounting in any position, ready to "plug-in". You can use this integrated power package to provide a simple, clean installation on your machine . . . no pulleys, belts, sheaves, bed plates, couplings, etc.

Electric motors are standard "D" flange type with slight shaft modification for driving helical primary reduction gears. Secondary reduction stage is a standard Cone-Drive double-enveloping worm gearset with maximum tooth engagement for greater load carrying capacity in smaller space.

Cone-Drive gearmotors are available for all AGMA service ratings. Call your Cone-Drive representative today or write for catalog #58 for complete specifications.



**CONE-DRIVE GEARS**
**DIVISION MICHIGAN TOOL COMPANY**
*7171 E. McNichols Road Detroit 12, Michigan Telephone: TWinbrook 1-3111*

DOUBLE-ENVELOPING WORM GEARSETS
DOUBLE-ENVELOPING WORM GEAR SPEED REDUCERS
DOUBLE REDUCTION WORM GEAR SPEED REDUCERS
DOUBLE-ENVELOPING RIGHT ANGLE GEARMOTORS

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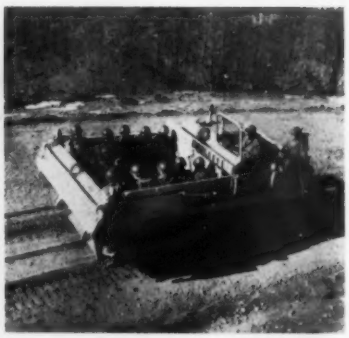
# NEWS

**from the power transmission field**

## *Amphibious bulldozer does 30 mph*



An amphibious dozer-tractor-grader, that's a 30-mph troop carrier, that's light enough to be air-dropped, poses numbers of transmission and suspension problems. Designers of International Harvester's prototype Universal Engineer Tractor (UET) showed their technical virtuosity by neatly solving all of them.

Built under contract to the U. S. Army by the company's Government Engineering Section, the UET could replace eight different pieces of equipment now in use by a typical airborne engineer batallion. This would result in a dramatic increase in mobility and a dramatic decrease in the spares and skills needed for service.

**Construction** of the UET is about 40% aluminum, with an airborne weight of 20,000-lb. To get sufficient working weight to doze, it loads itself with earth or ballast which doubles the airborne weight and gives it a maximum drawbar pull of 17½ tons.

The problem of combining an unsprung earthmover with a highway convoy vehicle was solved by a hydropneumatic suspension system which allows the driver to turn his springs on and off with a control handle—the UET literally raises and lowers itself by its own bootstraps.

Each of the eight wheels on the fully-tracked vehicle is individually sprung by hydraulic rotary actuators and gas springs, called accumulators. When actuators are disconnected from accumulators, the tractor is unsprung for scraping and dozing. Control of hydraulic fluid in the actuators governs height and tilt of dozer and scraper cutting edges.

**Power** for the UET comes from a 250 hp (at 3000 rpm), V-eight liquid-cooled gasoline engine, rear mounted. A power shift planetary transmission provides four forward and two reverse speeds.

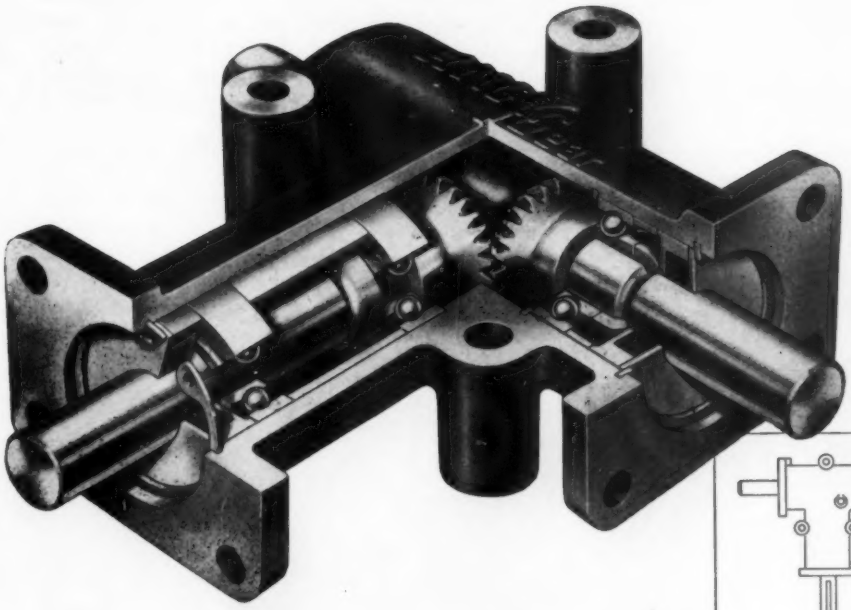
**Total length** of the crawler is 18 ft 4 in., well within airborne limitations, and it can pivot turn 180 degrees in a space 23 feet wide. With a low center of gravity, it can operate ascending, descending or side-slope on grades of at least 60 percent. Nine feet high to the top of the windshield, the UET does a hydropneumatic squat, folds its windshield down and thus reduces its height to 6 ft 8 in. for airdrop loading.

While this prototype is being tested at Ft. Belvoir, a new version is already on the drafting boards. It will be powered by a diesel engine and have a hydrostatic drive which will combine steering, braking and all forward and reverse motion in a single control lever.

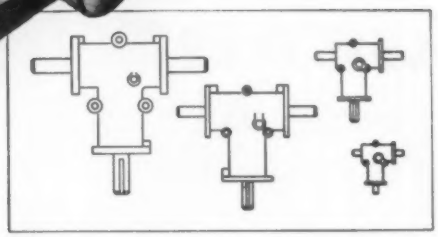
## *G. E. subcontracts Lear for Project Apollo*

General Electric Company's Missile and Space Vehicle Department announced that Lear, Inc. is one

# There is only one ANGLgear*... and it is made only by Airborne



Quality of ANGLgear construction is evident in cutaway view. ANGLgear gives you all the features of other drives, plus greater hp range (⅓ to 5); permanent lubrication; and Coniflex* design gears for more even load distribution, reduced wear, quieter operation.



ANGLgear is available from local distributor stocks in 4 sizes, 16 models, with various gearing and shaft options.

ANGLgear – introduced in 1951– is the *original* standardized right-angle drive. It is also the No. 1 product in its field – in sales, availability, quality, performance. Witness the thousands of satisfied customers who have bought ANGLgear to date – for applications ranging from simple manual control of valves to classified installations aboard nuclear submarines.

In design and construction, ANGLgear has been refined to the point of being virtually foolproof, provided it is not grossly overloaded. Take a unit off the shelf, install it, run it–for years. And attention is seldom required.

Besides being maintenance-free, ANGLgear is also easy to design into your power transmission systems because of its universal mounting feature. And it invariably costs less than other types of drives. ANGLgear is distributed nationally and is available immediately from local distributor stocks in the models listed here. Special sizes, special gear ratios, etc., can also be furnished. For complete engineering data, contact our local distributor, or write direct for new Catalog IA-58. *ANGLgear design template kits are available on request.*

*Trademark of the Gleason Works

BASIC MODEL DATA

| Model | Type | Gear Ratio | HP | RPM Output Shaft | Ultimate Static Torque lb. in. Output Shaft | Shaft Dia. | Wt., lb. |
|---|---|---|---|---|---|---|---|
| R-300 | 2-way | 1:1 | 1/3 | 1800 | 250 | 3/8 | .5 |
| R-300-2 | 2-way | 2:1 | 1/5 | 1800 | 250 | 3/8 | .5 |
| R-310 | 3-way | 1:1 | 1/3 | 1800 | 250 | 3/8 | .5 |
| R-310-2 | 3-way | 2:1 | 1/5 | 1800 | 250 | 3/8 | .5 |
| R-320 | 2-way | 1:1 | 1 | 1800 | 1000 | 5/8 | 2.2 |
| R-320-2 | 2-way | 2:1 | 3/5 | 1800 | 1000 | 5/8 | 2.2 |
| R-330 | 3-way | 1:1 | 1 | 1800 | 1000 | 5/8 | 2.4 |
| R-330-2 | 3-way | 2:1 | 3/5 | 1800 | 1000 | 5/8 | 2.4 |
| R-333 | 2-way | 1:1 | 2-1/4 | 1200 | 1500 | 3/4 | 8.7 |
| R-333-2 | 2-way | 2:1 | 2-1/4 | 1200 | 1900 | 3/4 | 8.7 |
| R-335 | 3-way | 1:1 | 2-1/4 | 1200 | 1900 | 3/4 | 9.0 |
| R-335-2 | 3-way | 2:1 | 2-1/4 | 1200 | 1900 | 3/4 | 9.0 |
| R-340 | 2-way | 1:1 | 5 | 1200 | 2500 | 1 | 14.5 |
| R-340-2 | 2-way | 2:1 | 5 | 1200 | 2500 | 1 | 14.5 |
| R-350 | 3-way | 1:1 | 5 | 1200 | 2500 | 1 | 15 |
| R-350-2 | 3-way | 2:1 | 5 | 1200 | 2500 | 1 | 15 |

AIRBORNE

*Engineered Equipment for Aircraft and Industry*

**AIRBORNE ACCESSORIES CORPORATION**

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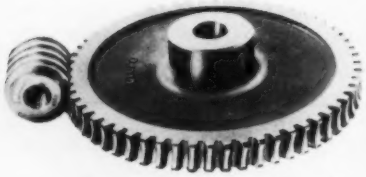
COMPLETE COVERAGE!

FROM STOCK

GLOBE WORM GEARS

RIGHT OR LEFT HAND



SINGLE, DOUBLE and QUADRUPLE THREADS in BRONZE and CAST IRON FROM 3 to 16 PITCH

*Available through Leading Power Transmission Distributors*

GLOBE STOCK GEAR DIVISION
34th and Clearfield Streets
Philadelphia 32, Pennsylvania

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## NEWS

of the thirteen subcontractors that G. E. is using for the Project Apollo study under a $250,000 contract with the National Aeronautics and Space Administration.

Project Apollo is the name given the next development effort in manned space craft after Project Mercury. Plans call for a craft that "will provide capabilities for manned reconnaissance flights to the vicinity of the moon as a logical step toward future goals of landing scientific teams on the moon and exploration elsewhere in the solar system."

General Electric was one of three organizations selected by NASA to work on the Project. Lear's Advanced Engineering Div. will assist in cockpit design and layout and in writing the functional display design specifications, and will also prepare physical specifications for the vehicle's instrumentation.

Work has already started on the control/display study, with completion date scheduled for about mid-May, 1961.

### *Boeing fir-tree turbine wheel in production*

The Boeing Industrial Products Division has started production of the new fir-tree turbine wheel for the company's T50 gas turbine engine. These are among the smallest fir-tree wheels produced today. The term "fir-tree" describes a turbine wheel with mechanically attached blades or buckets. Both the 7-inch diameter 66-blade gas producer and 9-inch 50-blade power turbine wheels in the T50 turbine are of fir-tree construction.

The fir-tree turbine wheels, which turn up to 38,000 rpm, were formerly of welded construction. The turbine wheel hub shown is broached from an Inconel X forging, a high-temperature, high-strength material requiring special production techniques. Fir-tree assembly will allow replacement of damaged turbine blades. Each blade, made of GMR-235 material, is held in place by a metal key. The T50 is a 270 shaft hp turbine.

***for***

- ***small sheave diameters***
- ***short centers • high speeds***
- ***quiet, vibrationless operation***

# New R/M CX* MOLDED V-Belts Outlast Others 8 to 1!

Other notched belts are cut at the sides . . . leave components exposed to atmosphere and permit separation, costly wear on sheave grooves. CX V-Belt is the *only* fully *molded* . . . fully *jacketed* notched V-belt. This exclusive R/M development provides drive design and performance advantages not possible with conventional belts.

- **No Cut Notches—No Exposed Sides—No Separation**
- **Quieter, Smoother, Cooler Running**
- **High Flexibility—Resists Flex-Cracking**
- **Holds Shape and Effective Length**
- **Micro-positioned Power Arch Strength Member**
- **Vibrationless—No Slap, No Hum, No Buzz**
- **Longer Drive Life**

Talk to R/M transmission specialists about new CX V-belts or other R/M belts for *every* drive application.

*Patented, made for original equipment

**The only fully molded, fully jacketed, notched V-belt made. Available in many sizes for a wide range of design requirements. Write for Bulletin M220.**

RM141

**RAYBESTOS-MANHATTAN, INC.**
**MANHATTAN RUBBER DIVISION • PASSAIC, N. J.**
*ENGINEERED RUBBER PRODUCTS*

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UP OR DOWN BAUER RUNS

Position a low-priced Bauer Gear Motor vertically or horizontally. Mount it up on a wall or down on the floor—even head down on the ceiling—it will deliver consistent, effective power for in-plant production use. Heavy duty helical gears of high-grade, case-hardened steel assure silent operation. And the compact, single-unit construction cuts down on maintenance time... reduces safety hazards. Bauer Gear motors deliver about 8,000 operating hours before gear box grease requires changing.

**Range:** from 1/50 to 30 HP. **Ratings:** 0.3 to 800 RPM.

All motors TEFC, Class II gears at no extra cost.

*Over 30 Years of Gear Power from* BAUER

*Distributed and serviced in 50 states.*
*For information, catalog and nearest distributor, write*

GEORG VON OPEL CORP. 15 WILLIAM ST., NEW YORK 5, N. Y.

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# NEWS

## *Five bearing sessions scheduled for ASLE Meeting*

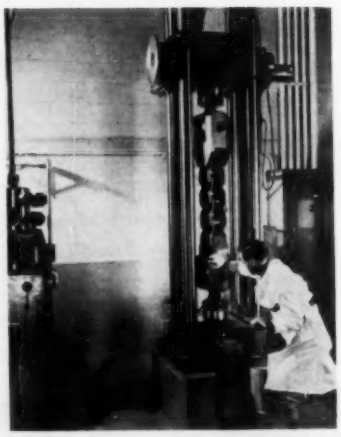
Five bearing and bearing lubrication sessions will be held during the American Society of Lubrication Engineers Annual Meeting (April 11, 12 and 13, Philadelphia). Two sessions will be on rolling contacts, one on gas lubricated bearings, one on bearings for heavy industry, and one on airframe bearings.

These will be part of a program that covers 19 sessions, more than 70 papers and three panel discussions, with the intention of having "something for everyone interested in lubrication."

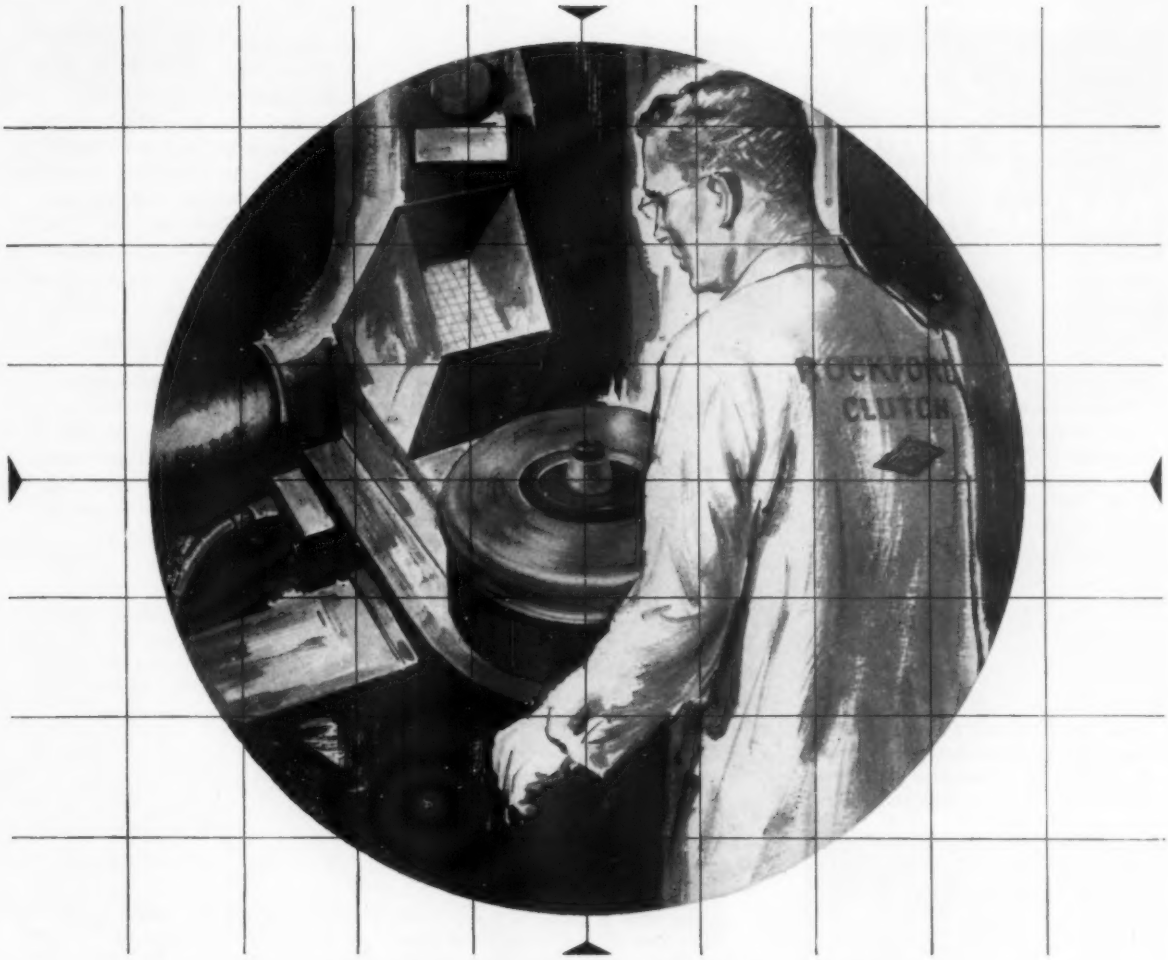
One session on gears will have papers on fretting, wear, rocket engine gear boxes and a method of determining gear oil stability. Another on seals and packings will cover metal bellows seals, mechanical carbon graphite, and seals for high temperature applications (600-1200 F).

## *Fatigue test machine installed at Chain Belt*

A new, 100-metric ton fatigue testing machine installed at Chain Belt's Milwaukee research center can test chains ranging from one thousand to over one million pounds in ultimate strength.



Built specially for Chain Belt by Alfred J. Amsler & Co., Schaffhouse, Switzerland, the tester is a




# DYNAMIC BALANCING ELIMINATES CLUTCH VIBRATION

*assures you smooth, enduring clutch performance*

**Rockford Clutches are vibration free . . . This means your on and off-highway vehicles or industrial machinery get extra-long clutch life, top power from your engines and extremely smooth engagements. Rockford eliminates vibration by dynamically and statically balancing each clutch. Above, a Rockford man spins a clutch on a special balancing machine. He then views electronic scope for vibrational-blips and removes**

heavy spots to insure perfect balance. Clutch vibration can ruin bearings . . . crack housings . . . damage crankshafts or other essential components. Consider the operator of your equipment . . . freedom from vibration means quite a bit to him, too. No uncomfortable nerve-jangling work here. Yes, quality construction is Rockford's key to efficient clutch reliability. Rockford offers a wide range of power controls. Write today for illustrated brochure.

## ROCKFORD CLUTCH

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Export Sales Borg-Warner International • 36 So. Wabash, Chicago, Ill.

ROCKFORD B-W CLUTCH DIVISION OF BORG-WARNER

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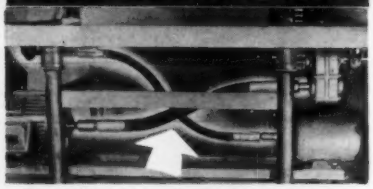
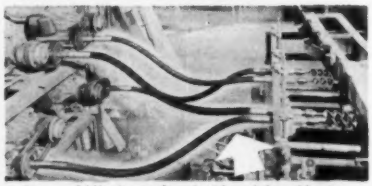
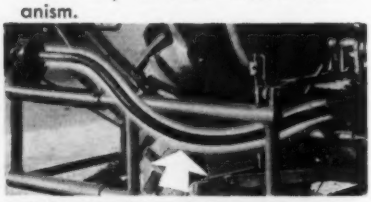
Here's how *Elliott*
**Flexible Shafts are Saving TIME and MONEY**



Two Elliott Standard Flexible Shafts drive special processing machine and vibrator operating simultaneously Flexible Shafts isolate vibration of table from motors.



Four ¾" Standard Flexible Shafts used in special production machinery in box manufacturing company eliminate parts and intricate mechanism.



Safety is enhanced, appearance improved by coupling bale loader to tractor's power take-off with a Standard Flexible Shaft. Separate gas engine for loader is eliminated.

One Elliott Flexible Shaft assembly can replace many parts, saving assembly time and labor. In one application, a Flexible Shaft for a textile machine replaced 50 parts, reduced cost of original mechanism by two-thirds.

Write for our Catalog **263**

'FLEXIBLE SHAFT DATA FOR DESIGNERS'

**B.W. ELLIOTT MFG. CO., INC.**
251 State St., Binghamton, N. Y.

Circle **18** on Reader Service Card

# NEWS

hydraulic machine which is operated with two pulsators. The pulsators regulate the stroke by pumping oil to a jack which is mounted on the machine proper. The tester accommodates a maximum dynamic load of 220,000-lb; it's driven electrically and operates at 300 to 600 cycles per second.

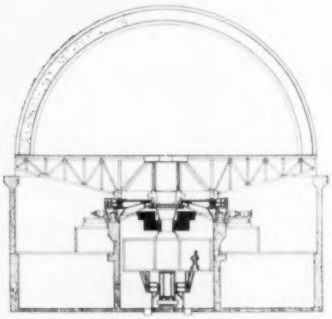
In addition to multiple-chain tests, an auxiliary 50-ton hydraulic jack—in conjunction with a special loading frame—can be used to test other products which are subject to normal fatigue failure.

## *Giant gear box rotates Nike Zeus antenna*

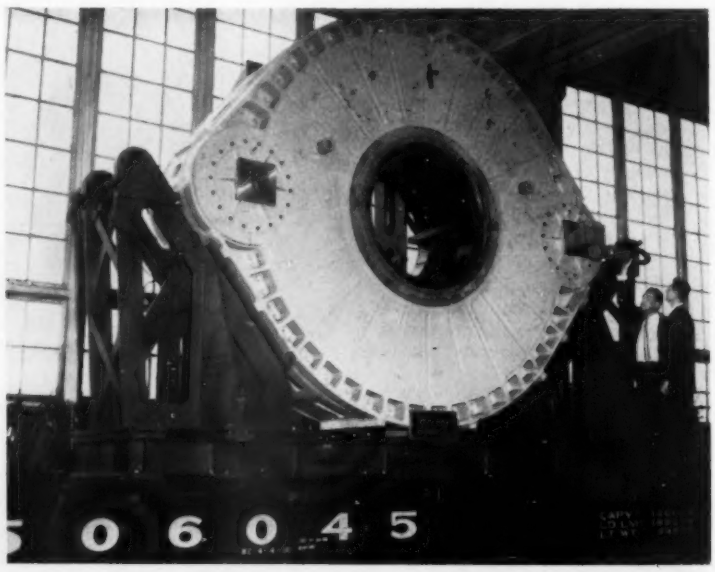
A 90,000-lb gear box, with tolerances finer than an accurate watch is used to drive the radar antenna of the U. S. Army's Nike Zeus guidance system. The drive rotates an entire underground room on which is mounted the tracking and acquisition antenna of the 50-ft anti-missile missile.

The Precision Products Div., of Western Gear Corp. built the big box in Lynwood, Calif. A special train, with speeds limited to 40 mph, was needed to transport it to Stockton, Calif., for embarkation. The drive had to be operated constantly during the trip in order to prevent brinnelling of the bearings. This was done by mounting an engine-driven power plant on the flat car. The largest single bull gear weighs 7½ tons. Value of the entire shipment was over $250,000.

Nike Zeus, a three-stage, solid-propellant missile, will have a radar system sufficiently accurate to intercept incoming rockets inside or outside the atmosphere.



**GEAR BOX** is shown in heavy black. Other black areas show position of transverse and elevation drives, and synchro-drive data gear box, all made by Western Gear Corp.



### *Rockwell-Standard's new division*

Rockwell-Standard has announced that its wholly-owned subsidiary, Air-Maze Corporation, of Cleveland, will operate as the Air-Maze Division of the company.

Air-Maze produces a line of gas and liquid filters for military and civilian aviation, for the heating, ventilating and air conditioning industry, and for many general industry applications.

As a division of Rockwell-Standard, Air-Maze will come under the supervision of C. A. Cooper, vice president of the miscellaneous products group of the Corporation.

### *N. H. Ball Bearings to build new plant*

Construction is scheduled to begin about May 1 on an 18,000-square foot plant for New Hampshire Ball Bearings Inc., in the new Arthur D. O'Shea Industrial Park being developed in Laconia, N. H.

This facility, the seventh major expansion in the Peterborough company's 15-year history, will increase the instrument ball bearing capacity. Plans provide for later expansion to 75,000 sq. ft.

Initial cost of the new plant building, machinery and equipment, is estimated at $750,000. Architectural plans for the building are not yet complete, nor has a contract for construction been let, but it is planned to have the plant "in production in late August or September," said president Arthur N. Daniels. New Hampshire is the first industry, to date, which has entered the 200-acre industrial park.

### *Boston appoints distributor*

American Biltrite Rubber Co., Inc., Boston Woven Hose & Rubber Div., has appointed Indianapolis Belting & Supply Co. its warehousing distributor for the states of Indiana, Kentucky and parts of Michigan and Ohio.

IT ALL ADDS UP TO THIS . . .

YOU CAN'T BUY SURE-FLEX PERFORMANCE IN ANY OTHER COUPLING AT TWICE THE PRICE

Wood's Sure-Flex Couplings not only have full, 4-way flexing action, but absorb from 5 to 15 times more shock and vibration than other leading flexible couplings. They swallow all types and combinations of angular and parallel misalignment and end float. Sure-Flex couplings are simple, easy to install. Standard models have only 4 basic parts . . no bolts, nuts, screws, clamps or covers. And, they last endlessly (6¼ million 15° peak torque flexes with no sign of wear). There's no metal-to-metal contact, no wear, no need for lubrication. Available in capacities up to 500 hp at unity service factor . . . in standard, junior, bushed and spacer types. There's a lot more to tell about Sure-Flex.

Write for BULLETIN 5103.

Woods

T. B. WOOD'S SONS COMPANY · CHAMBERSBURG, PENNSYLVANIA

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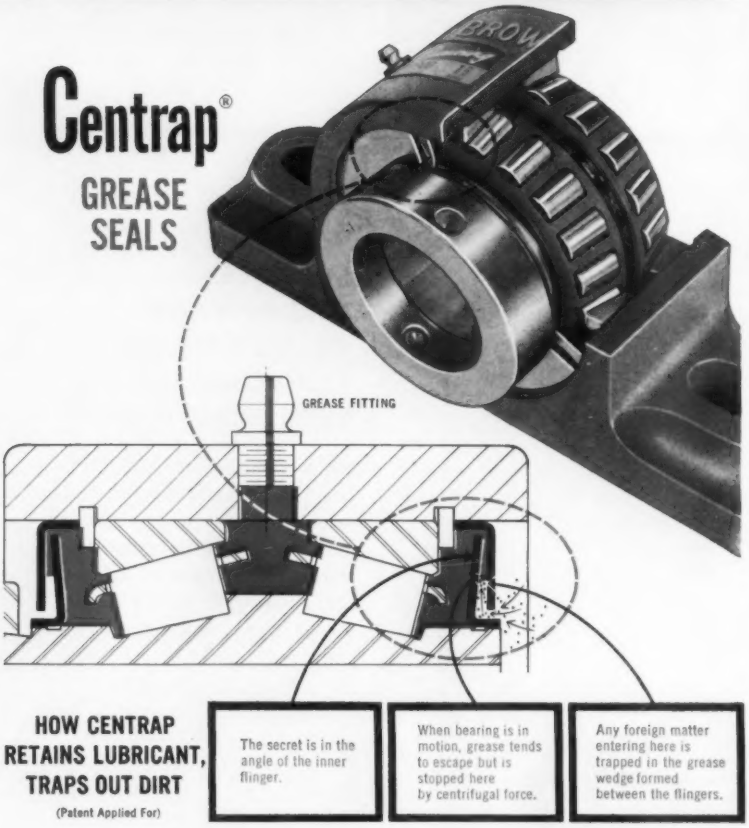
Browning BEARING UNITS...

Centrap®
GREASE
SEALS




HOW CENTRAP RETAINS LUBRICANT, TRAPS OUT DIRT
(Patent Applied For)

The secret is in the angle of the inner flinger.

When bearing is in motion, grease tends to escape but is stopped here by centrifugal force.

Any foreign matter entering here is trapped in the grease wedge formed between the flingers.

Browning gives you an exclusive new feature in tapered roller bearing units. It is CENTRAP, a unique sealing device that utilizes lubricant to trap out dirt . . . yet always permits drainage of excess grease. CENTRAP adds improved operating efficiency to these many other advantages in Browning tapered roller bearing pillow blocks and flange blocks: •Stronger *malleable* housings for compact design, lighter weight •Timken high-capacity bearings •Eccentric locking collars •Elongated bolt holes •Full range of sizes.

Get details on the complete Browning line of bearing units. Ask your Browning Distributor for Catalog BU-103, or write **Browning Manufacturing Company, Maysville, Kentucky.**

Browning... OUR 75th YEAR

POWER TRANSMISSION EQUIPMENT

Circle **8** on Reader Service Card

# COMING EVENTS

**APRIL**

**1- 3** Council of Engineering Society Secretaries, Hotel Roosevelt, New York.

**4- 7** Society of Automotive Engineers, National Aeronautic Meeting (including production forum and engineering display), Hotel Commodore, New York.

**6- 7** American Society of Mechanical Engineers—Society for the Advancement of Management, Management Engineering Conference, Statler-Hilton Hotel, N. Y.

**10-11** American Society of Mechanical Engineers, Maintenance and Plant Engineering Conference, Bancroft Hotel, Worcester, Mass.

**17-19** International Meeting on Fluid Sealing. Sponsored by the British Hydromechanics Research Association, Grosvenor Hall, Ashford, Kent, England.

**MAY**

**8- 9** American Society of Mechanical Engineers, Lubrication Symposium Deauville, Hotel, Miami Beach, Fla.

**10-12** American Society of Mechanical Engineers, Production Engineering Conference, Royal York Hotel, Toronto.

**11-13** American Institute of Industrial Engineers, 12th Annual National Conference and Convention, Sheraton Cadillac Hotel, Detroit.

**22-25** American Society of Mechanical Engineers, DESIGN ENGINEERING CONFERENCE AND SHOW, Cobo Hall, Detroit.

# POOLE Flexible Couplings

Look at these features—many of them exclusive with the patented POOLE:

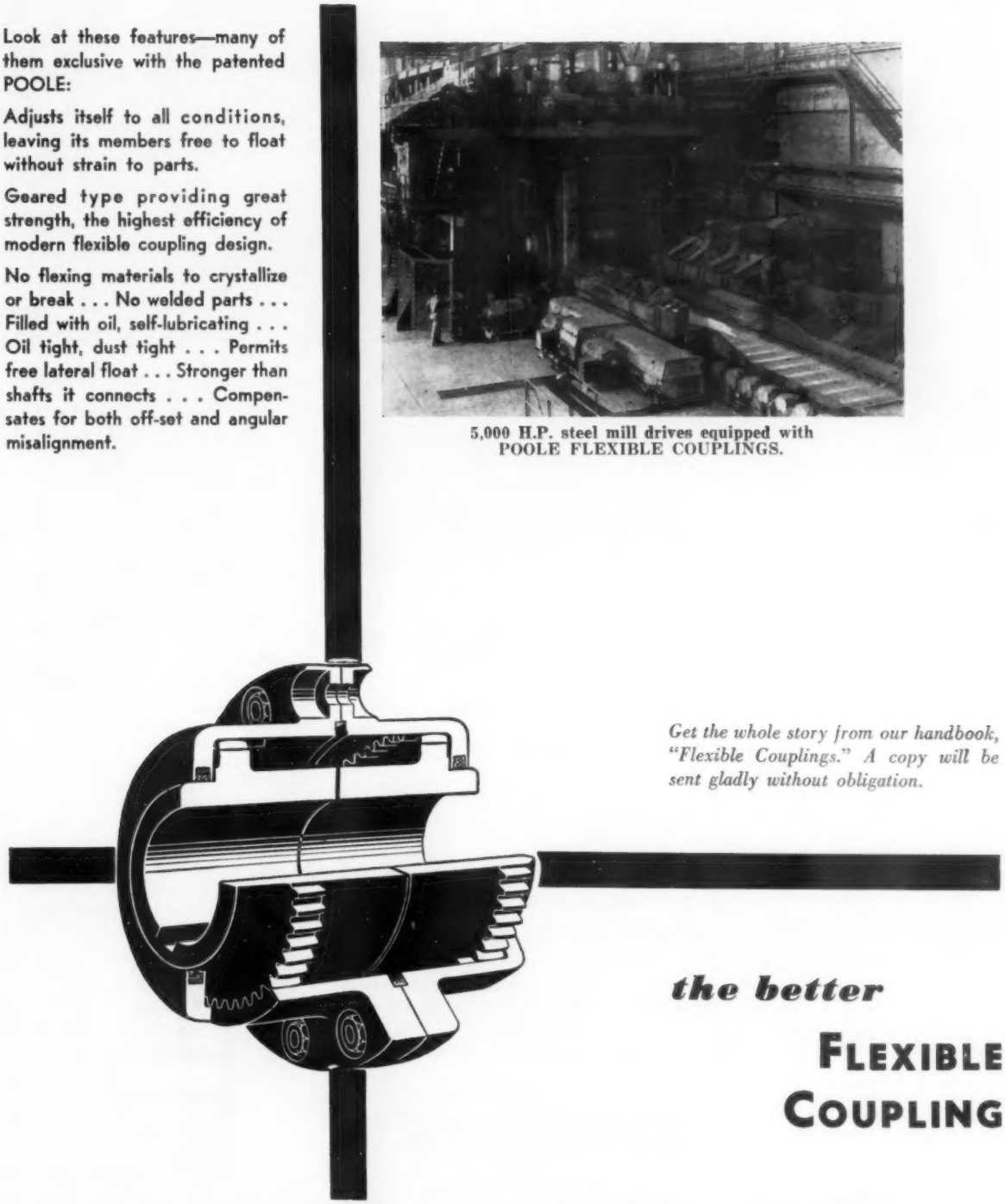
Adjusts itself to all conditions, leaving its members free to float without strain to parts.

Geared type providing great strength, the highest efficiency of modern flexible coupling design.

No flexing materials to crystallize or break . . . No welded parts . . . Filled with oil, self-lubricating . . . Oil tight, dust tight . . . Permits free lateral float . . . Stronger than shafts it connects . . . Compensates for both off-set and angular misalignment.



**5,000 H.P. steel mill drives equipped with POOLE FLEXIBLE COUPLINGS.**



*Get the whole story from our handbook, "Flexible Couplings." A copy will be sent gladly without obligation.*

***the better***

**FLEXIBLE COUPLING**

**POOLE FOUNDRY & MACHINE COMPANY**

BALTIMORE 11, MD.

Circle **34** on Reader Service Card

# Look, Folks...No Jolts!

***– and no reduced voltage starter!***

***– no oversize motor!***

Introduce Flexidyne into your drive system and your stubborn loads take off smoothly, without the necessity of oversize motors or costly controls. Flexidyne provides the equivalent of a "no load" start, reduces maintenance, protects motors against shock or overload, and operates at 100% efficiency at full load speed!

Across the nation — on jaw crushers as above, on mixers, ball mills, cranes, conveyors, cotton cards — in wire drawing and elsewhere — thousands of Flexidynes are performing brilliantly. Here is the *new and better* way to start loads smoothly!

Flexidyne is available from stock in 8 drive sizes and 10 coupling sizes for capacities to 1000 hp. Ask your Dodge Distributor, or write us for complete technical bulletin.

Dodge Manufacturing Corporation, 8200 Union St., Mishawaka, Indiana

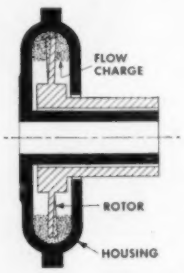


## FLEXIDYNE

**THE DRY FLUID DRIVE**

The "fluid" in Flexidyne is heat treated steel shot. A measured amount, called the flow charge, is contained in the housing which is keyed to the motor shaft. When the motor is started centrifugal force throws the flow charge to the perimeter of the housing, packing it between the housing and the rotor which transmits power to the load.

After the starting period of slippage between housing and rotor the two become locked together and achieve full load speed, operating without slip and at *100% efficiency*.




***The Products with the Pluses...*** **DODGE**

***of Mishawaka, Ind.***

**CALL THE TRANSMISSIONEER,** your local Dodge Distributor. Factory trained by Dodge he can give you valuable assistance on new cost-saving methods.

Circle **16** on Reader Service Card

**HARD PARTS WITH LOOSE FIT**

Allow angular and parallel misalignment and end float. No electrical insulation between connected shafts. Limited torsional flexibility. Need lubrication.

**HARD PARTS WITH TIGHT FIT**

Allow angular and parallel misalignment. Not usually torsionally flexible. No electrical insulation between connected shafts. Need lubrication.

**FLEXIBLE OR RESILIENT PARTS**

Allow angular and parallel misalignment and end float. Wide range of torsional flexibility according to type. Types with non-metallic flexing member electrically insulate connected shafts. Generally need no lubrication.

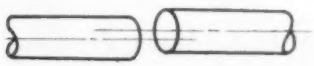
# FLEXIBLE COUPLINGS

- *What they are*
- *How to select them*
- *Who makes them*
- *Where they're used*

AN EVERYDAY PROBLEM in designing power transmission systems is the connection of two coaxial shafts so that one can drive the other. Typical examples of this are: connecting an electric motor shaft to the input shaft of a speed reducer, and connecting a variable-speed drive to its driven load. In such cases a flexible coupling should be used.

## *Why use a flexible coupling?*

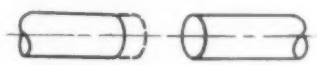
When coaxial shafts are connected, it's never possible to align them perfectly accurately. There is always eventual wear and damage to the connected components and the bearings on the shafts. There are four conditions which may exist when shafts are connected, for which a flexible coupling will compensate. These conditions are:



**1. OFFSET MISALIGNMENT—Shaft axes are parallel but offset.**

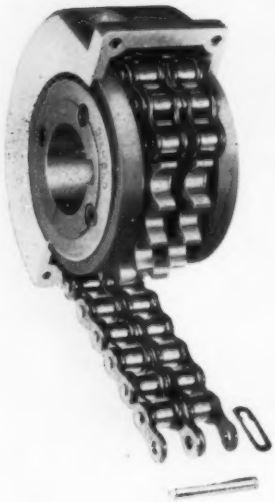
**2. ANGULAR MISALIGNMENT—Shaft axes are not parallel, but intersect at the coupling point.**

**3. OFFSET AND ANGULAR MISALIGNMENT—A combination of 1 and 2.**

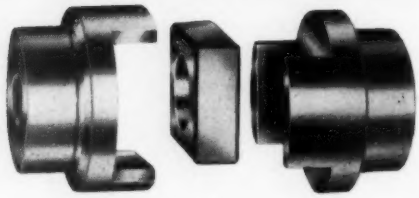


**4. END FLOAT—Shaft temp. change causes length changes. These result in end thrusts. There may be other causes.**

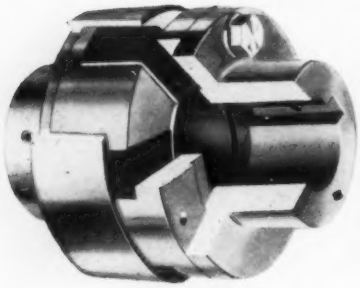
There are two other possible benefits from a flexible shaft coupling. First of these is torsional vibration damping. Second is electrical insulation



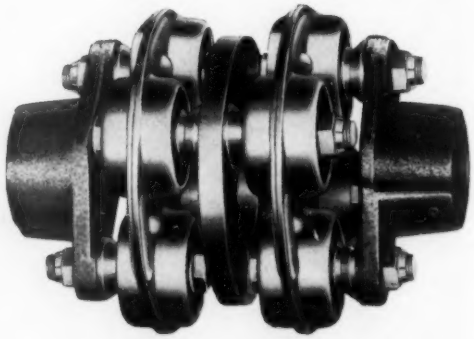
**CHAIN TYPE** The sprockets are connected by standard ASA roller chain. Some designs use special chains. Single removable connecting pin permits quick assembly or disassembly of chain. All-steel construction with hardened sprocket teeth. Diamond Chain Corp.



**SLIDER TYPE** Two flanged hubs connected by a square non-metallic slider member. The C-shaped jaws engage opposite sides of slider, permitting relative sliding motion of the two flanges at right angles to each other. Center member retains lubricant. Zurn Industries, Inc.



**JAW TYPE** This model has one set of jaws in removable ring form. Pulling the jaw ring outward gives enough clearance for independent rotation of either end of the coupling. Lovejoy Flexible Coupling.



**RUBBER BUSHING TYPE** Two flanged hubs bolted to alternate preloaded neoprene biscuits in a center spider member. This is a double model for high shock absorption with two center members and a center plate adapter. Morse Chain Co.

### SERVICE FACTORS

Usually the diameter of the largest shaft to be connected determines the proper size of the coupling. When in doubt, this simple formula is suggested for computing the required capacity:

HP x Service Factor = Required HP

| Types of Equipment | | Motor Drive | Hydraulic Drive | Internal Combustion Drive |
|---|---|---|---|---|
| Very Light | Agitators, Fans, Centrifugal Circulating Pumps | 1.0 | 1.2 | 2.0 |
| Light | Welders, Paper Shredders, Oscillating Pumps, Winders, Rubber Calenders, Drill Presses, Centrifugal Feed Pumps, Woodworking Machinery | 1.3 | 1.5 | 2.5 |
| Medium | Lathes, Planers, Rams, Pulp Beaters, Actuator Pumps, Elevators, Boring Mills, Gear Cutters | 1.8 | 2.1 | 3.5 |
| Heavy | Punch Presses, Hoists, Shears, Marine Propulsion, Rolling Mills, Compressors, Well Drills, Mining Machinery | 2.2 | 2.5 | 4.0 |
| Very heavy | Bar Stock Shears, Rock Crushers | 2.8 | 3.2 | 5.1 |

of one shaft from the other. Whether or not either of these is desirable, depends on the application. There are jobs where the driven shaft must be exactly aligned with the driving shaft at all times and torsional flexibility cannot be allowed.

### *What makes a coupling flexible?*

There are many variations in flexible coupling design. But, they are all based on three ways to make the coupling flexible:

Type 1. Use loosely fitted hard parts.
Type 2. Use tightly fitted hard parts with sliding action.
Type 3. Use flexible or resilient parts.

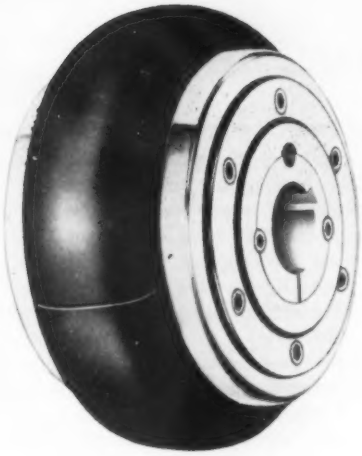
Some basic differences in the three types are shown in the box on page 19. There are certain kinds of couplings which combine characteristics and features of more than one type.

## Type 1

Types of couplings which fit in this category are the chain and gear types, Fig. 2. They will allow angular misalignment, parallel misalignment, and end float. They do not offer electrical insulation between shafts. Torsional deflection is limited to that resulting from flexing or yielding of the chain and sprocket teeth, or the gear teeth.

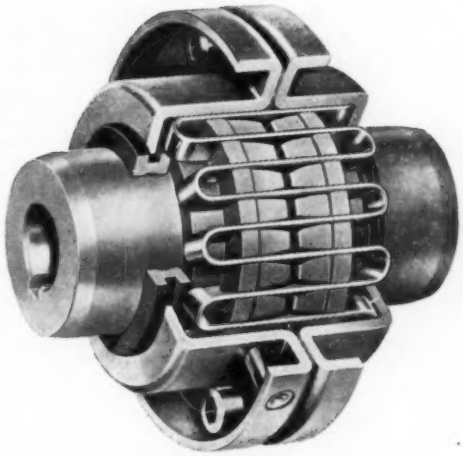
A chain coupling is just two sprockets with hubs for attachment to the shafts. The two sprockets are con-

**RUBBER GEAR TYPE**
Two metal flanges and a flexible rubber gear or sleeve. The teeth of the sleeve lock into mating teeth in the flanges without clamps or screws and tighten under torque. T. B. Wood's Sons Co.



**RUBBER TIRE TYPE**
Two flanged hubs with taper bushings connected solely by a molded reinforced rubber tire section. Tire is split laterally for assembly and disassembly and is held in position by clamping rings bolted to each flange. Dodge Mfg. Corp.

**GRID SPRING**
Two flanged hubs connected by a flat steel spring wound in the form of a grid. Rungs of grid member fit into mating grooves in each flange. The whole is encased in a dust-cover. The Falk Corp.



**GEAR TYPE**
Two externally geared hubs flexibly engage an internally geared sleeve. There are many variations of this type on the market. This model has three spiral cam locking fasteners which can be detached and the coupling opened. Link-Belt Co.

## TABLE I — TYPE 1 FLEXIBLE COUPLING CHARACTERISTICS SUMMARY

| | Angular Misalignment (deg, max) | Parallel Misalignment (in.) | End Float (in.) | Torsional Flexibility | Electrical Insulation | Speed (rpm, max) | HP (max @ 1800 rpm) | Lube needed |
|---|---|---|---|---|---|---|---|---|
| Chain | 1 - 3 | .005 - .04 | .02 - .2 | Very low | No * | 5,000 | 3,100 | Yes |
| Gear | 1 - 10 | .016 - 1.00 | 1/16 - 2 | Very low | No * | 50,000 | 60,000 | Yes |

## TABLE II — TYPE 2 FLEXIBLE COUPLING CHARACTERISTICS SUMMARY

| Angular Misalignment (deg, max) | Parallel Misalignment (% shaft diam) | End Float (in.) | Torsional Flexibility | Electrical Insulation | Speed (rpm, max) | HP (max @ 1800 rpm) | Lube needed |
|---|---|---|---|---|---|---|---|
| 1/2 - 3 | 1 - 10 | 1/32 - 1 | None | No | 85 - 10,000 | 5,000 | Yes |

## TABLE III — TYPE 3 FLEXIBLE COUPLING CHARACTERISTICS SUMMARY

| | Angular Misalignment (deg, max) | Parallel Misalignment (in.) | End Float (in.) | Torsional Flexibility (deg.) | Electrical Insulation | Speed (rpm, max) | HP (max @ 1800 rpm) | Lube needed |
|---|---|---|---|---|---|---|---|---|
| Metal | 1 - 2 | .01 - .1 | 1/8 - 3/4 | 0 - 1 3/4 | No | 7,000 | 0.11-13,000 | No |
| Nonmetal | 1 - 10 | .01 - 3/16 | 1/16 - 3/8 | 1/4 - 30 | Yes | 10,000 | 0.03- 3,500 | No |

*Non-metallic couplings of this type may provide electrical insulation.

nected by a length of double chain. The chain may be roller or silent type. Some manufacturers use standard roller chain; others use special chains.

Lubrication is necessary with chain couplings. The lubricant is retained in a close-fitting cover which wraps around the coupling. The cover also serves as a safety device by covering up the teeth so the outer surface of the rotating coupling is smooth and cannot catch or snag.

Gear couplings are made up of meshing internal and external gears or splines. Single-engagement types use one of each. Double-engagement types use two. Most of them are double-engagement. Flexibility in these results from both the fit of the teeth and from special shaping of the teeth that permits them to pivot relatively. In general, these couplings permit more angular deflection, parallel misalignment, and end float than chain types.

With few exceptions, gear couplings must be lubricated, and are designed with a complete housing, seals, and provision for relubrication. The exceptions have one or more of the gears made of nonmetallic material. The materials used include, nylon, molded fiber, and special rubber compounds. Couplings using nonmetallic gears also offer additional torsional resilience compared to those using metallic gears, in addition to electrical insulation.

Sizes and ratings: Table I is quick reference to the general characteristics and performance ratings of Type 1 flexible couplings. The Flexible Coupling Selection Guide, pp. 23, 24 gives more specific details of what's available from major manufacturers.

## Type 2

These couplings compensate for angular and parallel misalignment. They have, in general, zero torsional flexibility and do not offer electrical insulation of the connected shafts. They have three members; two hubs for connection to the shafts and a center sliding member or slider. The slider is driven by jaws or a key and, in turn, drives the other hub by the same method. Jaws or keys are at right angles to each other.

Slider couplings must be lubricated. The slider may be made of a self-lubricating material or oil impregnated sintered metal to accomplish this. Some incorporate lubricant reservoirs. Replaceable bearing strips are used on some of the sliders.

Table II shows the general area covered by couplings of this type. Many of the small couplings used for fhp and instrument drives are of this type.

## Type 3

There are probably more design variations and manufacturers of couplings in this group than in the other two combined. The flexible elements used in these couplings may be metal, rubber, leather, or plastic. Most widely used are metal and rubber. Typical couplings using metallic flexible elements are shown on pages 20, 21. Some of the many designs using non-metallic flexible elements are also shown on these pages.

Couplings in this group will allow angular and parallel misalignment, and end float. Torsional flexibility covers a wide range. Some have virtually none, while certain of those using rubber flexible elements have more torsional flexibility than any other type of coupling.

Most of the couplings in this group do not need lubrication. Exceptions are those using flexible metallic elements. An extremely wide range of speeds and horsepowers is covered by these couplings. Table III shows general characteristics of this group.

### Selection

Selection of the right flexible coupling is primarily a matter of matching job requirements with coupling specifications. Tables I, II, and III can be very helpful in quickly determining the right coupling for the job in many cases. For example, the gear coupling combines highest speed and horsepower ratings with high end float. Torsional flexibility is found to a high degree only in couplings using flexible coupling elements.

There are many applications where job requirements might be met by any of the available types of flexible couplings. In these cases, additional factors to be considered are:

- Installation and removal
- Lubrication
- Size and weight
- Cost
- Quietness of operation

—and characteristics of the prime mover.

The type or nature of the load must also be considered when selecting a flexible coupling. Horsepower or torque rating of the coupling must be modified to allow for these. Table IV is a typical chart showing how these things affect hp rating. Actual hp of the job is multiplied by the service factor to find the rating of the coupling to use. Table IV should not be used for actual coupling selection. There are wide variations in service factors for different flexible couplings, so that service factors for the make and type of coupling selected should be used.

### Installation precautions

Flexible couplings should not be used in attempting to compensate for deliberate misalignment of connected components. If the job is one where misalignment must exist, universal joints or flexible shafting should be considered. Flexible couplings are only intended to compensate for unavoidable minor misalignments.

It follows, therefore, that when a flexible coupling is installed, every possible effort should be made to see that no angular or parallel misalignment exists. For the same reasons, cases involving high definite temperature cycling should use thermal compensators rather than flexible couplings. Deliberate axial motions should use special designs such as sleeves.

Again, flexible couplings are intended to compensate

# Flexible Coupling Selection Guide

| MANUFACTURER | TYPE | | | | | | | CAPACITY hp @ 100 rpm | | | | | | SPEED (rpm, max) | | | BORE (in.) | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Chain | Gear | Slider | Jaw | Pin & Bushing | Flexible, Metal | Flexible, Non-metal | Less than 1 | 1 - 5 | 5 - 25 | 25 - 50 | 50 - 100 | Over 100 | 1200 or less | 1200 - 1800 | Over 1800 | Less than ½ | ½ - 1 | 1 - 2 | 2 - 3 | Over 3 |
| Actuator Products | | | | | | ✓ | | ✓ | | | | | | ✓ | ✓ | ✓ | ✓ | | | | |
| Ajax Flexible Coupling Co. | | ✓ | | | ✓ | | | | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | | ✓ | ✓ | ✓ | ✓ |
| American Stock Gear Div. | | ✓ | | | | | | | | ✓ | ✓ | | | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | |
| Charles Bond Co. | | | | ✓ | | | | ✓ | ✓ | ✓ | | | | | | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Boston Gear Works | | | | ✓ | | | | ✓ | ✓ | ✓ | | | | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | |
| Brown Engineering Co. | | ✓ | | | ✓ | | | | | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | | ✓ | ✓ | ✓ | ✓ |
| Browning Mfg. Co. | ✓ | | | ✓ | | ✓ | | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Bushings, Inc. | | | | | | | ✓ | ✓ | ✓ | ✓ | | | | ✓ | ✓ | | ✓ | ✓ | | | |
| Chain Belt Co. | ✓ | | | | | | | | | | | ✓ | | | | ✓ | | | | | ✓ |
| Climax Metal Products Co. | | | | | | | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | | ✓ | ✓ | ✓ | ✓ | ✓ |
| Continental Diamond Fibre Co. | | ✓ | | | | | | ✓ | ✓ | ✓ | | | | ✓ | ✓ | ✓ | | ✓ | ✓ | ✓ | |
| Cullman Wheel Co. | ✓ | | | | | | | | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Dalton Gear Co. | ✓ | | | | | | | | | ✓ | ✓ | | | | | ✓ | ✓ | | | | ✓ |
| Detroit Power Coupling Co. | | | | ✓ | | | | | | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Dial Products Co. | | | | | | ✓ | | ✓ | ✓ | | | | | | | ✓ | ✓ | ✓ | | | |
| Diamond Chain Co., Inc. | ✓ | | | | | | | | | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | | ✓ | ✓ | ✓ | ✓ |
| Dodge Mfg. Corp. | | | | | | | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | | | ✓ | ✓ | ✓ |
| Dykman Mfg. Corp. | | ✓ | | | | | | | | | | | ✓ | | | ✓ | | | | | ✓ |
| Elliott Co. | | | | | | | ✓ | | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| F.A.B. Mfg. Co. | | | | | | ✓ | ✓ | ✓ | ✓ | ✓ | | | | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Falcon Machine & Tool Co. | | | | | | ✓ | | | | | | | ✓ | | | ✓ | | | | | ✓ |
| Falk Corp. | | | | | | ✓ | | | | | | | ✓ | | | ✓ | | | | | ✓ |
| Flaton Machine Works, Inc. | ✓ | | | | | | | | | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Foote Bros. Gear & Machine Corp. | ✓ | ✓ | | | | | | | | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | | | ✓ | ✓ | ✓ |
| Gerbing Mfg. Corp. | | | | ✓ | | ✓ | ✓ | | | ✓ | ✓ | ✓ | | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Guardian Products Corp. | | | | | | ✓ | | ✓ | ✓ | ✓ | ✓ | | | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Helical Products Co. | | | | | | ✓ | | ✓ | | | | | | | | ✓ | ✓ | | | | |
| Hewitt-Robins, Inc. | | | | | | ✓ | | | | ✓ | | | | | ✓ | | | ✓ | ✓ | ✓ | ✓ |
| D. O. James Gear Mfg. Co. | | | ✓ | ✓ | | | | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | | ✓ | ✓ | ✓ | ✓ |

# Flexible Coupling Selection Guide

| MANUFACTURER | TYPE | | | | | | | CAPACITY hp @ 100 rpm | | | | | | SPEED (rpm, max) | | | BORE (in.) | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Chain | Gear | Slider | Jaw | Pin & Bushing | Flexible, Metal | Flexible, Non-metal | Less than 1 | 1 - 5 | 5 - 25 | 25 - 50 | 50 - 100 | Over 100 | 1200 or less | 1200 - 1800 | Over 1800 | Less than ½ | ½ - 1 | 1 - 2 | 2 - 3 | Over 3 |
| Koppers Co., Inc. | | ✓ | | | | | | | ✓ | ✓ | ✓ | ✓ | ✓ | | | ✓ | | ✓ | ✓ | ✓ | ✓ |
| Kupfrian Mfg. Corp. | | | | | | ✓ | ✓ | | | ✓ | ✓ | ✓ | | ✓ | | | ✓ | | | | |
| Link-Belt Co. | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Lord Mfg. Co. | | | | | | | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | | ✓ | ✓ | ✓ | ✓ |
| Lovejoy Flexible Coupling Co. | | | | ✓ | | ✓ | | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Main Engineering & Machine Works, Inc. | | | | | | ✓ | | ✓ | | | | | | ✓ | | | ✓ | ✓ | ✓ | | |
| The Marley Co. | | | | | | | ✓ | | ✓ | | | | | | | ✓ | | | ✓ | | ✓ |
| Metron Instrument Co. | | | | | | ✓ | | ✓ | | | | | | | | ✓ | ✓ | | | | |
| Morse Chain Co. | ✓ | | | | ✓ | | | | | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | | ✓ | ✓ | ✓ | ✓ |
| Oliver Gear & Machine Co., Inc. | ✓ | | | ✓ | | | ✓ | | | ✓ | ✓ | ✓ | | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| PIC Design Corp. | | ✓ | ✓ | | ✓ | | ✓ | ✓ | ✓ | ✓ | | | | | | ✓ | ✓ | | | | |
| Philadelphia Gear Corp. | | ✓ | | ✓ | | | | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Poole Foundry & Machine Co. | | ✓ | | | | | | | | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | | ✓ | ✓ | ✓ | ✓ |
| Rampe Mfg. Co. | | | | ✓ | | | | ✓ | | | | | | ✓ | ✓ | ✓ | ✓ | | | | |
| Renbrandt Inc. | | | | | ✓ | | | ✓ | | | | | | | | | ✓ | | | | |
| Robertshaw-Fulton Controls Co. | | | | | | ✓ | | | | | | | | ✓ | | | ✓ | | | | |
| Ryle Mfg. Co. | ✓ | | | | | | | | | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | | ✓ | ✓ | ✓ | ✓ |
| Sier Bath Gear & Pump Co., Inc. | | ✓ | | | | | | | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| F. W. Stewart Corp. | | | | | | ✓ | | ✓ | | | | | | | | ✓ | ✓ | | | | |
| Tann Corp. | | | | | | ✓ | | | | ✓ | | | | | ✓ | | ✓ | ✓ | ✓ | | |
| Thomas Flexible Coupling Co. | | | | | | | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Union Chain & Mfg. Co. | ✓ | | | | | | | | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Union Gear & Sprocket Corp. | ✓ | | | | | | | ✓ | ✓ | ✓ | ✓ | ✓ | | | | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| United States Rubber Co. | | | | | | | ✓ | | | ✓ | ✓ | | | | | ✓ | ✓ | ✓ | ✓ | | |
| Van Gelder Mfg., Inc. | | | | | ✓ | | | | | ✓ | | | | | ✓ | ✓ | | ✓ | ✓ | ✓ | |
| Waldron Hartig Div. | | ✓ | | | | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| T. B. Wood's Sons Co. | | | | | | | ✓ | | ✓ | ✓ | ✓ | | | ✓ | ✓ | ✓ | | ✓ | ✓ | ✓ | |
| Zurn Industries, Inc. | | ✓ | | ✓ | | | | | | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | | | |

*This selection guide was compiled from information supplied by the manufacturers, and may be incomplete.*

only for slight misalignment. And, their life is shortened by misalignment.

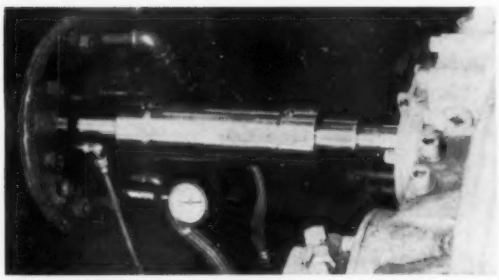
Use of a straightedge and feeler gages during installation to ensure accurate alignment is recommended in many cases. In all instances, the manufacturers installation instructions should be studied and followed. Here are two typical drive problems solved by the use of flexible couplings:

## Turbine driven pump

**PROBLEM:** ***Investigate coupling a steam turbine to a 400 hp refrigerator-compressor, with particular emphasis on:***

- ***misalignment from temperature changes***
- ***isolation of compressor from turbine axial thrust***
- ***limiting the transmission vibration***

***Turbine uses 750 F steam, compressor is running at 30 F. Shaft diameter is 1½ in., speed, 7,000 rpm, operating continuously.***



**SOLUTION:** In the field, the two shafts must be aligned by shimming under the turbine prior to start-up. Then the equipment is run up to working temperature, and re-checked immediately . . . hot. Both parallel and angular misalignment may have changed, due to the uneven temperature distribution over the equipment. The shafts should be re-aligned to provide minimum misalignment at operating conditions. The movement of the shafts during temperature change must be absorbed by the coupling. This suggests a coupling of the gear or bellows type. From Tables I, II & III, the speed appears to fall in Type I better than Type III. Hence, a gear coupling will be considered. It is selected for this case from Zurn Industries, Inc., Mechanical Power Transmission Division, Erie, Pa., tables. These show a service factor of 2 for this application.

The coupling fitting the specifications is then found to be their GCE—101¼, rated at 17 hp/100 rpm, and maximum speed for 19,800 rpm.

It will take angular misalignment of ¾ degree per tooth mesh, and for a 12-in coupling length, parallel offset can be 0.167-in. Recommended lubrication is oil, to be checked annually.

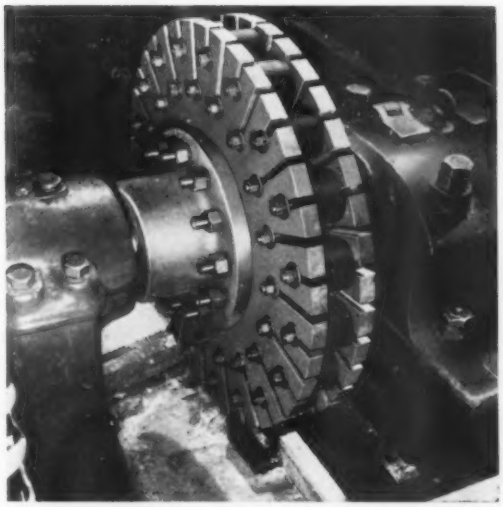
Even now, there may be vibration in the shafts. This can be caused by imbalance of the coupling itself, and can be corrected by balancing it, in one plane.

Balancing will only be effective if it is done carefully. Shaft speed and vibration amplitude should be measured very accurately. The vibration may change very rapidly with slight changes in speed, if a resonant condition is approached. Coupling bolts may be stripped very easily in this case. New bolts should weigh exactly the same as the ones they replace. It will normally require only a fraction of an ounce to balance the coupling. An extra lock washer, placed under the right bolt head, may suffice.

Isolation of the compressor from axial thrust of the turbine is normally a simple matter. The gear coupling will take care of the matter up to about 2-in. (Table I). The coupling is also suitable for absorbing the very light vibrations generated by the system.

## Motor driven rubber mill

**PROBLEM:** ***A coupling was required between a 400 hp electric motor and a gear reduction unit for two 60-in. rubber mills. Shaft diameter on the mill was 6-in., on the motor, 4-in. There is considerable noise generated by the units involved. It is hoped that lubrication can be avoided, and the coupling is to have a life-span of at least 20 years. The coupling will turn at 400 rpm. Angular, parallel, and axial misalignment are present, and may grow worse with time.***



**SOLUTION:** The misalignment-time requirements will be met by a flexible element coupling of Type III. However, the high torque requirements make it very difficult to use an off-the-shelf coupling.

The Lord Manufacturing Company, Erie, Pennsylvania, was consulted, and recommended a flexible non-metallic coupling similar to their J-3658 flexing spool coupling. Service factor for the application is light (say 1.5), but the diameters are sometimes difficult to meet with standard couplings. Their resulting special design was 34 in. in diameter, and incorporated 38 flexing bolts on two concentric bolt circles. It has now been in service for 20 years without attention, and is operating perfectly.

# V-belts drive high-speed drills

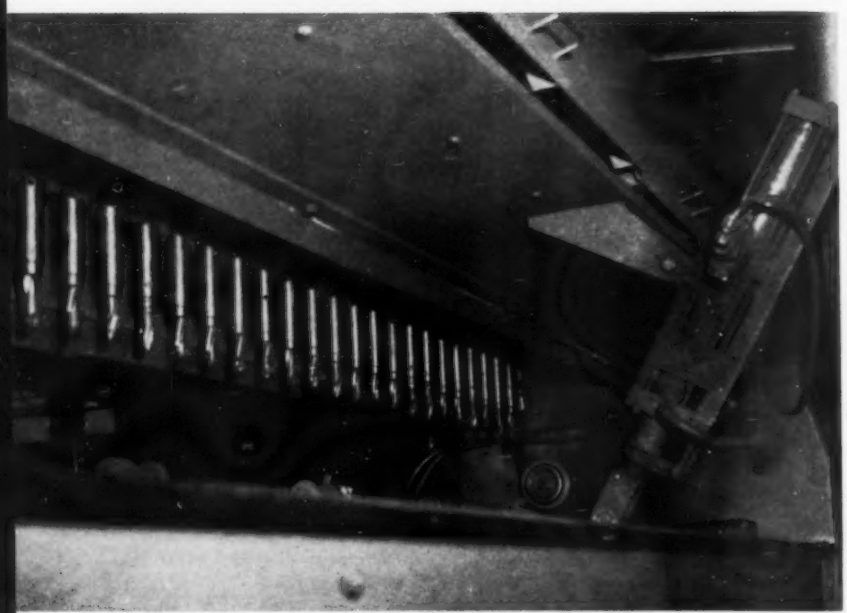
BELT CONTACT ARC of only about 105 degrees is enough for V-belts to drive high-speed spindle pulleys on a drilling machine. The machine is installed in the Barton, Wis. plant of Line Material Industries, McGraw-Edison Co., Milwaukee, who makes bituminous fiber electrical conduit and pipe for drainage, and septic systems.

The pipes are made in lengths from 5 to 10 ft, of 2 to 8 in. diameter material. In waste disposal, for example, where water drains into filter beds, the pipe is perforated with 5/8 in. drilled holes. They may set as close as 3 in. on centers, and there may be as many as 36 holes in a pipe.

The holes are drilled in one operation on the drilling machine. The 36 spindles are lined up on 3 in. centers. Each motor drives two spindles through V-belts. Eighteen 3/4 hp motors power the machine.

Motors are mounted vertically and alternated to conserve space —one with shaft down, the next with shaft up. Motor speed is 3450 rpm, and spindle speeds are stepped up to 3898 rpm. Any motor may be cut out individually, in case not all drills are to be used simultaneously. Any pair of spindles can be stopped without stopping the machine.

The V-belts are 3/8 in. wide and 35 1/2 in. long. Pitch diameter of each motor sheave is 3 in., and the pitch diameter of each spindle sheave is 2.65 in. Despite the limited arc of contact, there is no slip at the spindle sheaves. Neither is there any unusual wear. Belts have been in service for 11 months, with no replacements to date. ◆



**BATTERY OF DRILLS** at 3 in. intervals are about to perforate a soil pipe. They will be moved by the hydraulic piston (right), and accomplish the drilling in about 10 sec.

Excessive heat build-up caused by constant flexing — even in environmental temperatures — is the major cause of V-belt deterioration. BOSTRON with Neoprene remedies this problem.

Neoprene withstands heat up to 165°F. (ordinary belts deteriorate at as low as 115°F.), and gives greater resistance to oils, ozone, chemicals, abrasion. This means a high safety margin, long life.

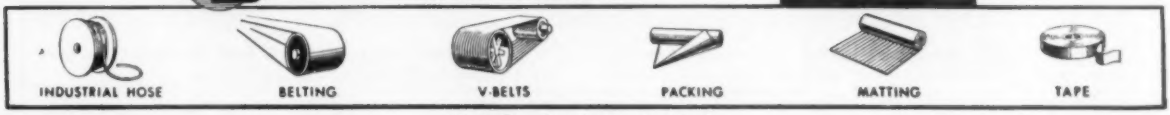
Neoprene with Fiber-Dispersed Stock in BOSTRON'S compression member provides: (1) high cross-wise rigidity, (2) exceptional length-wise flexibility, and (3) extra tensile member support. Fibers are closely packed, in straight lines, and virtually frictionless.

BOSTRON'S Tensile Member, by actual test, gives greater stability, 40% more strength, and is inherently stretch resistant. Moisture gain is only 1/20th that of conventional reinforcing fiber. A special heat and tensioning process for the cords further minimizes stretch. BOSTRON withstands more shock loading, needs less maintenance, and shows minimum growth even after months of operation.

*Inside and out, your best buy is* **BOSTRON V-BELTS** *with* **NEOPRENE**

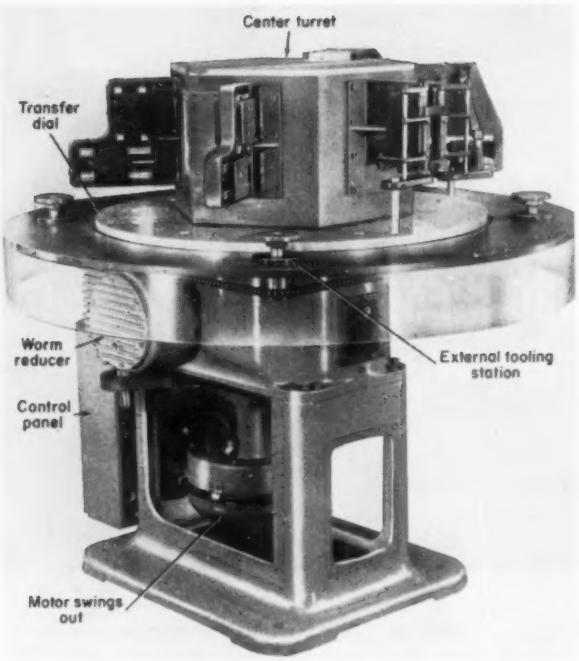
AMERICAN BILTRITE RUBBER COMPANY
BOSTON WOVEN HOSE & RUBBER DIVISION
BOSTON 3, MASSACHUSETTS

BOSTON




Circle 7 on Reader Service Card

# All-mechanical automation machines

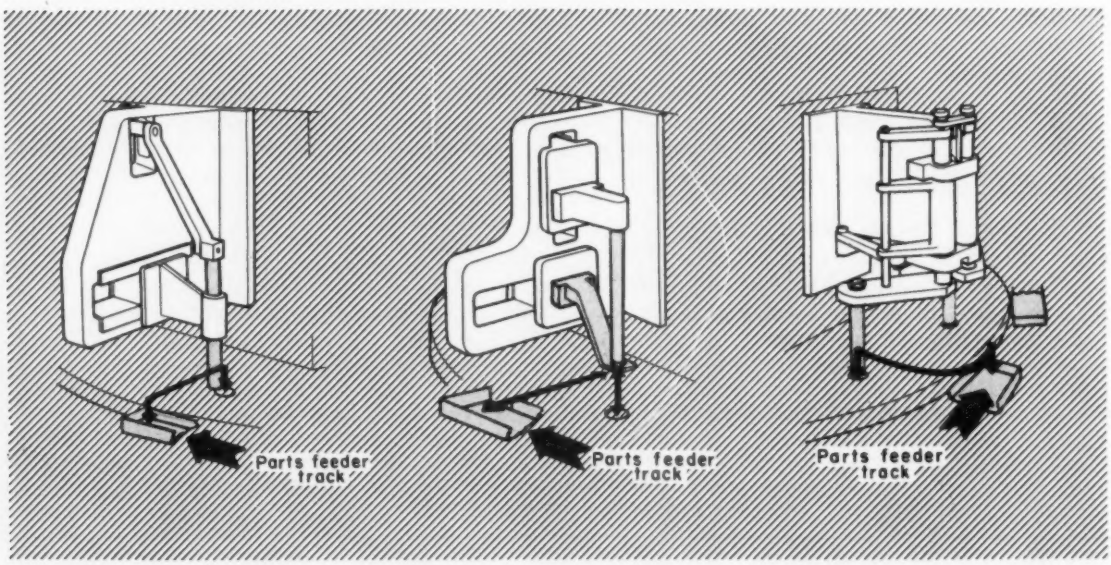



THE ELEMENTS OF AUTOMATED PRODUCTION are built into a new line of machines by Ferguson Machine Corp., St. Louis, Mo. These elements are grouped into a comparatively small number of categories.

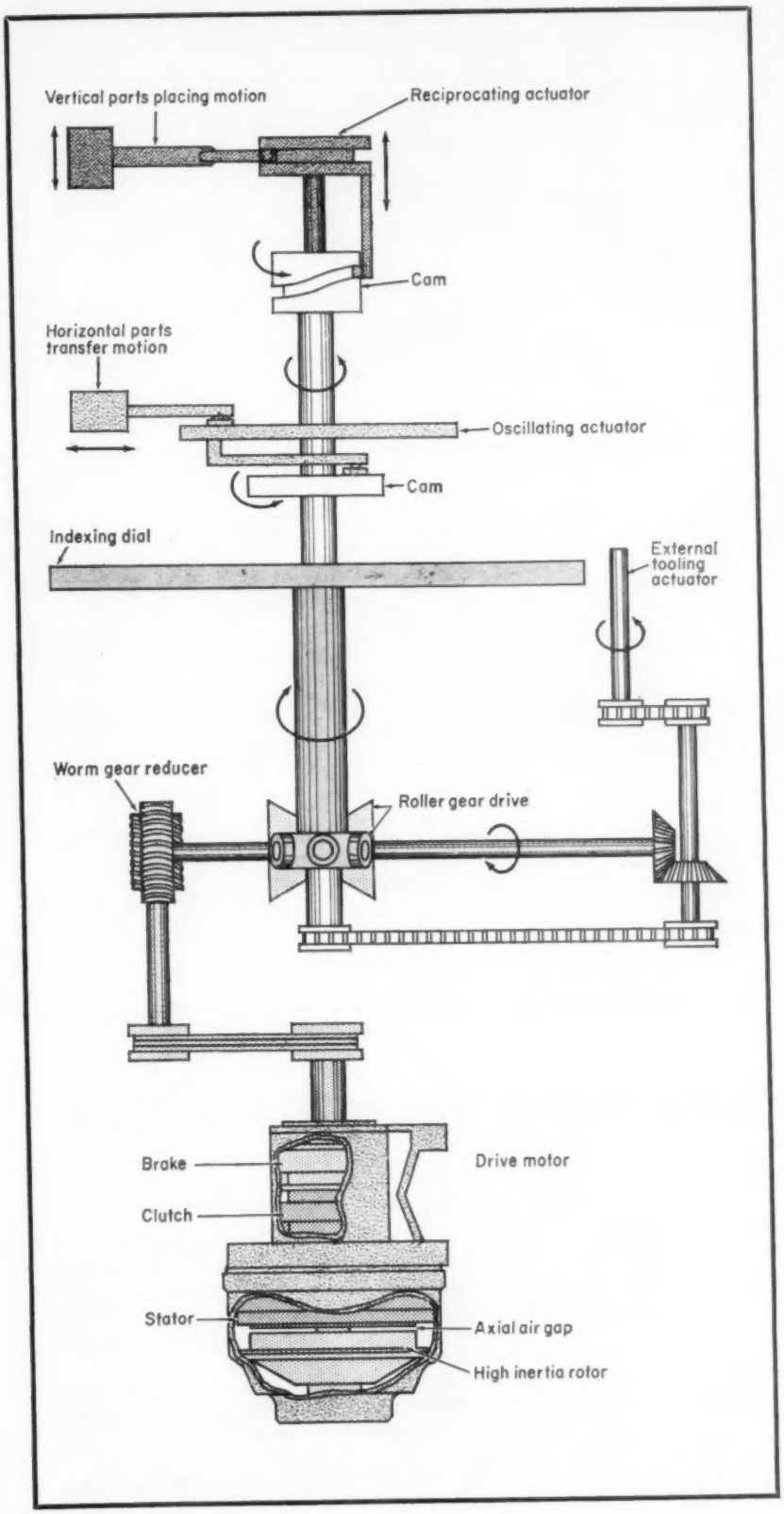
The machines furnish the principal working motions of automatic assembly as standard characteristics. The only special parts required are the actual workpiece holders. Small manufacturers, claims Ferguson, can now enjoy the benefits of automation previously reserved for the big companies.

The Standard Rotary Assembly Machine is designed for small or large production runs. Cams and mechanical linkages make a large variety of horizontal and vertical motions possible at the work stations. The completely mechanical relationships between indexing dial and workstations make it easy to vary the motion set-ups. Changing the pivot points or the actuating cams gives an entirely different production operation.

Timing of various motions can overlap one another, providing longer handling times within the operating cycle. Motions are precise, and smooth, regardless of operating speed. ◆



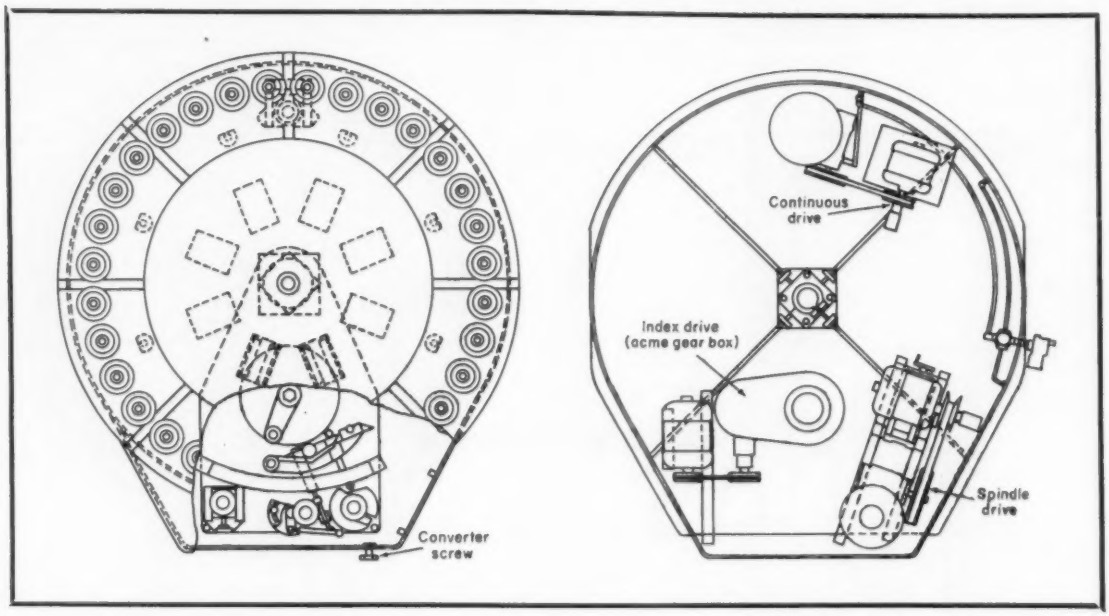

**THREE TYPICAL** parts-placing mechanisms, powered from the center turret. Shaded components are special tools that conform to product parts being assembled. Each mechanism can easily be attached to the basic Ferguson machine.




**PIVOT-MOUNTED DRIVE MOTOR**—a 1½ hp Vari-Power Unit—swings out for maintenance, after removing the timing belt and tensioning turnbuckle. The motor has a heavy rotor which stores energy to accommodate momentary high loads up to 3 times the normal maximum. The clutch-brake coupling is a safety device. It may be electrically interlocked to provide a variable dwell during the indexing cycle. Indexing and parts-placing motions are related by using the same shaft to drive the indexing dial and the center turret cam-shaft. Ferguson's roller gear drive is an indexing-cam drive. It will perform 20,000 high-speed precision operations without maintenance. The right-angle power takeoff drives both the transfer motions and external tooling stations for new or additional working motions.

**SPINDLES** are easily-replaced cartridge type so that many different parts can be finished on the same machine, without lengthy changeover procedures. Each coffee pot is loaded at the work station (foreground), and rotated continuously throughout the cycle, until it returns to be unloaded.

**INDEXING DRIVE** and continuous drive are both powered by 1-hp 1200 rpm motors. The spindle is driven from a 1½-hp, 1800 rpm motor, through a variable-speed reduction drive.




# Versatile drives make versatile buffer

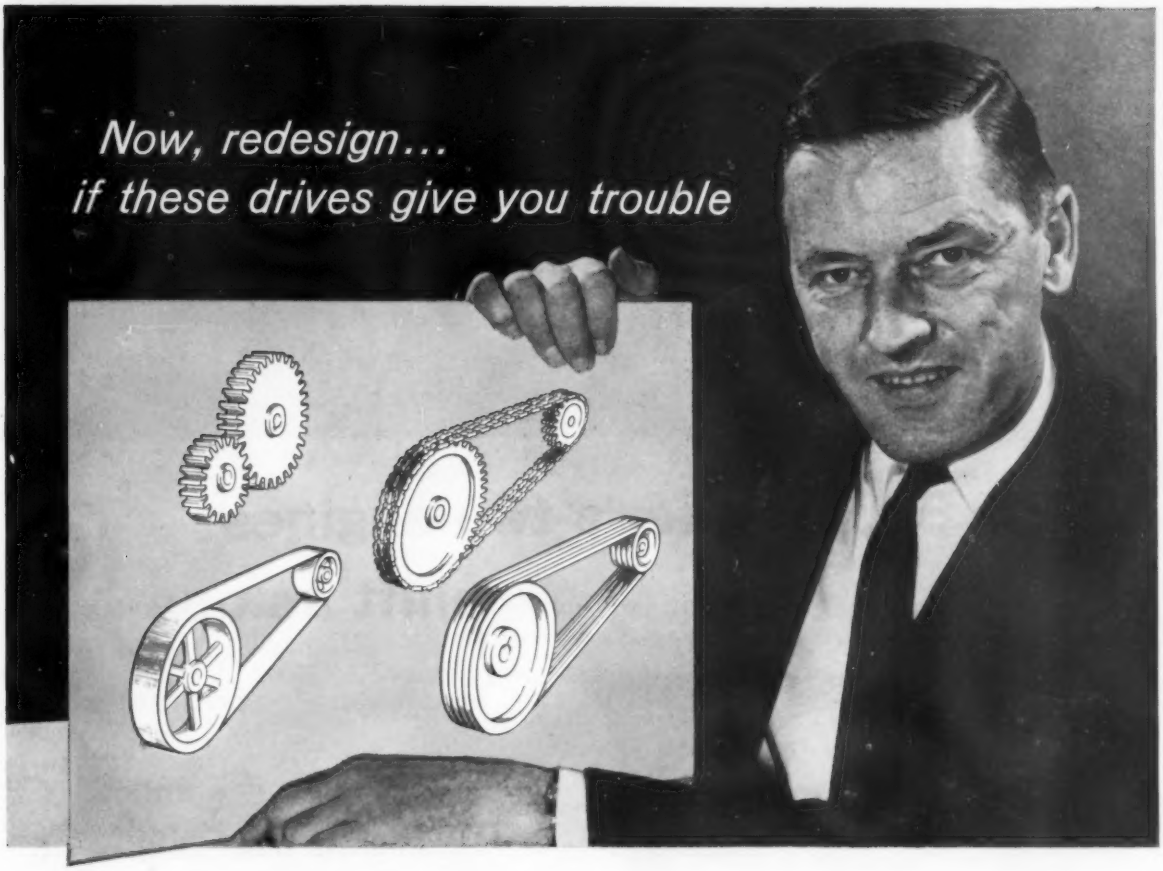
IN LESS THAN ONE MINUTE, a buffer-polisher machine can be converted from continuous rotary motion to rotary indexing, or vice versa. This makes the same machine useful for production runs or for short specialty-item runs.

Three motors drive the indexing motion, the continuous drive motion, and the spindle drive. Limit switches prevent the continuous drive and indexing drive motors from being engaged at the same time. Turning a screw at the work-station converts the machine from indexing to continuous motion.

An air-lift, synchronized with the index table, can lift the polishing and buffing heads during the indexing motion. The gearboxes are made to the company's own design. "We're sure of the quality, this way," chief engineer De Meulemeester told Power Transmission Design, "and we can use the same gearbox on a number of our other machines."

The eight-station machine can buff parts at a production rate of 2,000 an hour. The line of buffer-polishers also includes a 7-station and a 12-station machine.

Manufactured by: Acme Manufacturing Co., Detroit. ◆



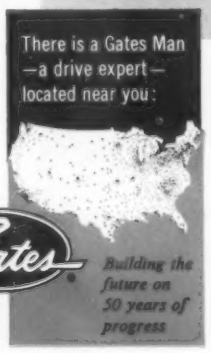

# Ask your local Gates Man to show you how Super HC Drives reduce machine down-time

If you have a chain, gear, flat belt or even a conventional V-belt drive that is causing costly production down-time or high maintenance costs, your local Gates Man will be glad to help you. He will show you how these troubles can be ended by using a Gates Super HC V-Belt Drive—the first and most advanced High Capacity drive.

Because of exclusive design features, Gates Super HC V-Belts handle up to 3 times the horsepower of conventional V-belts in the same space—or they can often handle the required horsepower in about half the space. Fewer belts are needed, and sheaves can be smaller and lighter weight. As a result, bearing loads are less, increasing bearing life, reducing maintenance costs.

Gates Super HC Drive is quiet, smooth-running and entirely dependable—multiple belts assure you of continuous operation, ending costly production losses. It is a highly resilient drive that protects your machine from vibration and damaging shock loads, increasing machine life and lowering maintenance costs—savings that often amount to many times the cost of the drive.

*The Gates Man located near you is a drive design expert. Ask your nearby Gates Distributor for his help when you have a drive problem.*




BP 41

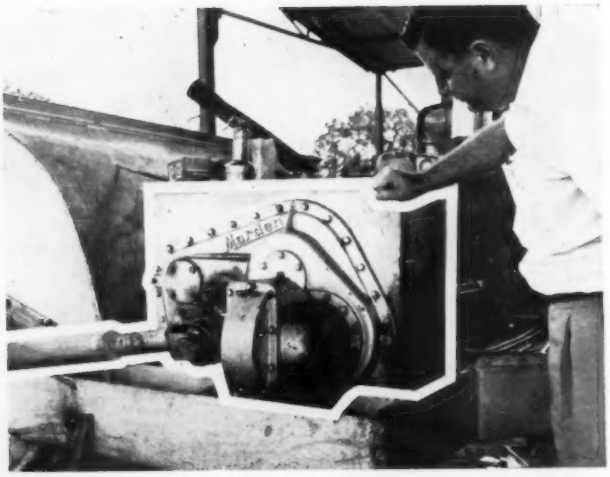
The Gates Rubber Company, Denver, Colorado

## Gates Super HC V-Belt Drives

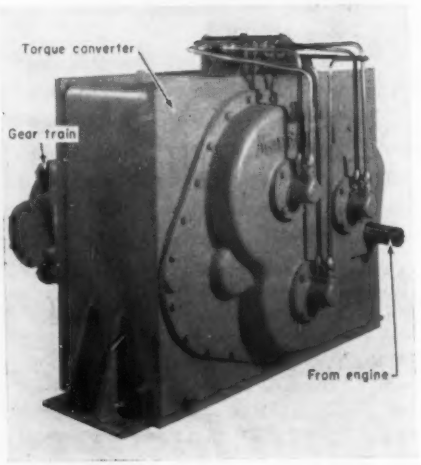
Circle **20** on Reader Service Card

**FASTER THAN** a tractor-drawn unit, the 32,000 lb brush-cutter requires considerably less maintenance. Twelve steel cutting blades are welded to the machine's two conical cutting drums. The machine is all-welded.

# Brushcuffer's two engines shift as one



**TWO ENGINES,** each with a separate transmission and power train, require simultaneous gear shifting, either for speed changing, or direction control. Four forward speeds and reverse are incorporated in the counter-shaft gearbox.

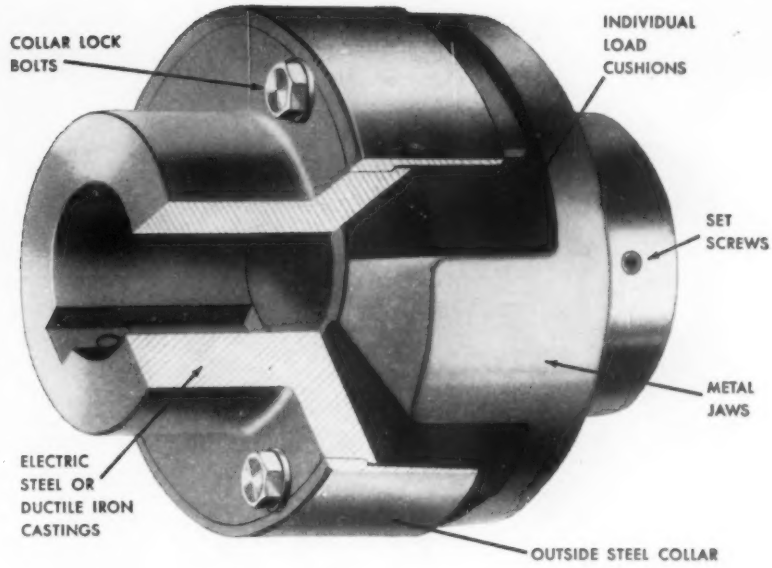



A SELF-PROPELLED brushcutter, capable of cutting a 7 ft swath through undergrowth and trees up to 6 in. in diameter, is driven by two identical engines and power trains.

The machine is the Marden PB-7, built by Marden Mfg. Co., Auburndale, Fla. It runs at 4 mph, and clears about 3½ acres an hour. A 132-hp engine drives each of the machine's two sections through a conical drum that serves as both wheel and brush cutter. Power transmission is through a torque converter and hydraulically-controlled gear trains. Synchronization is maintained through the hydraulic shift, controlled by manually-operated solenoids in the control cabin. The makers rejected alternative means of synchronizing the two cutter wheels. Electric and hydraulic drives were too costly, and automatic transmissions could not be made to shift in unison satisfactorily. Other operator controls are a throttle and an hydraulic steering control. ◆

A Report To Equipment Manufacturers

# LOVEJOY TYPES C and H FLEXIBLE COUPLINGS UP TO 4250 hp.




## Installed and Aligned In Minutes

Just slide on the shaft, bring the jaws together and insert cushions. A twist of the bolts on the outside collar firmly retains the visible cushions.

Alignment is equally simple. Just use a straight edge. Gauges are not required.

## Eliminate Trouble and Service Calls

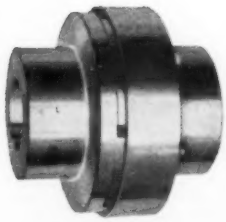
Lovejoy Flexible Couplings contain no intricate parts or mechanisms that require attention or can cause possible trouble. All parts, including cushions, are in plain sight for rapid inspection. Lubrication is never required. Water, oil, dirt or weather will not harm or in any way decrease efficiency.

The best care for Lovejoy Couplings is to *put 'em on shafts and let 'em alone.*

## Outlast Equipment Life

Bodies are carefully machined from electric steel or ductile iron castings. The load is entirely transmitted by cushion compression, eliminating metal-to-metal contact and resultant wear on metal parts and jaws.

Even the cushions last longer. First, they are furnished in the material best suited to the service. Second, on non-reversing loads, their life can be doubled simply by reversing or advancing.



Lovejoy Flexible Couplings can be delivered immediately from stock. Heavy-Duty Types C and H run from 18 to 4250 hp. at 1200 rpm. in a wide range of bore sizes. Other sizes and types run from .05 at 100 rpm. to 1020 hp. at 1600 rpm. to provide the most complete selection of couplings available to industry.

Request full information and ask for Catalog C-58. Give details or specifications for prompt quotation.

Lovejoy
FIRST NAME IN FLEXIBLE COUPLINGS

**LOVEJOY FLEXIBLE COUPLING COMPANY**

4852 W. LAKE STREET, CHICAGO 44, ILLINOIS

Telephone EStebrook 9-3010 • Teletype TWX-CG-85

SALES OFFICES THROUGHOUT THE CONTINENT

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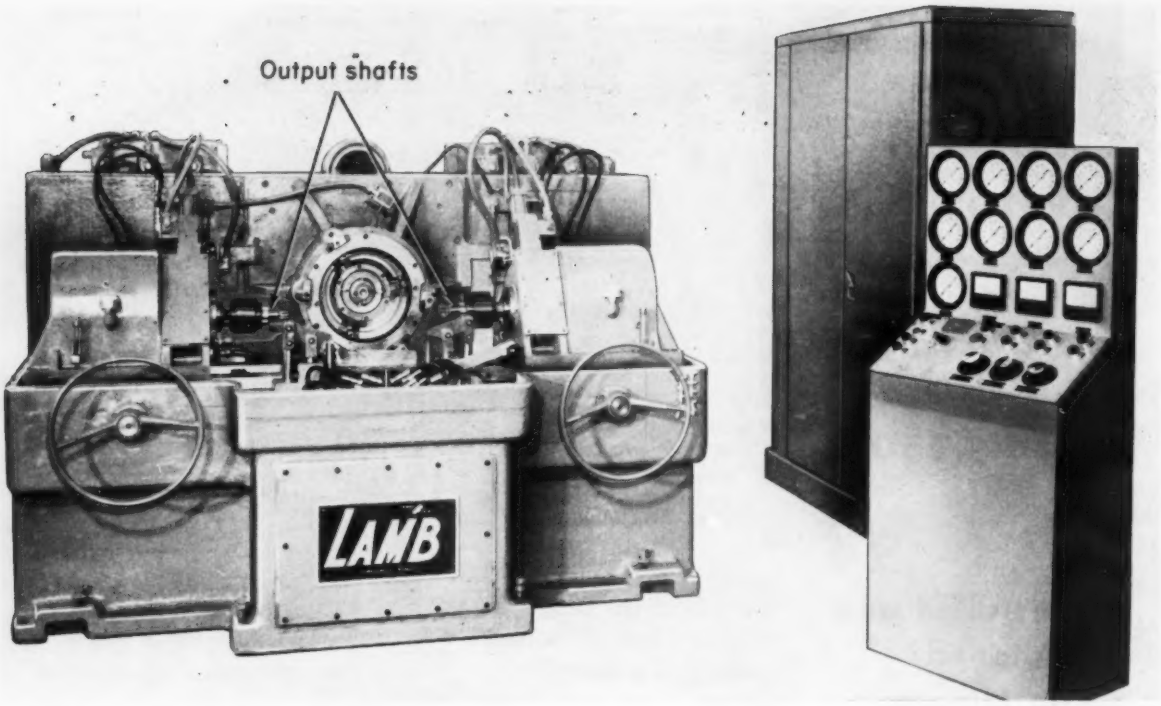
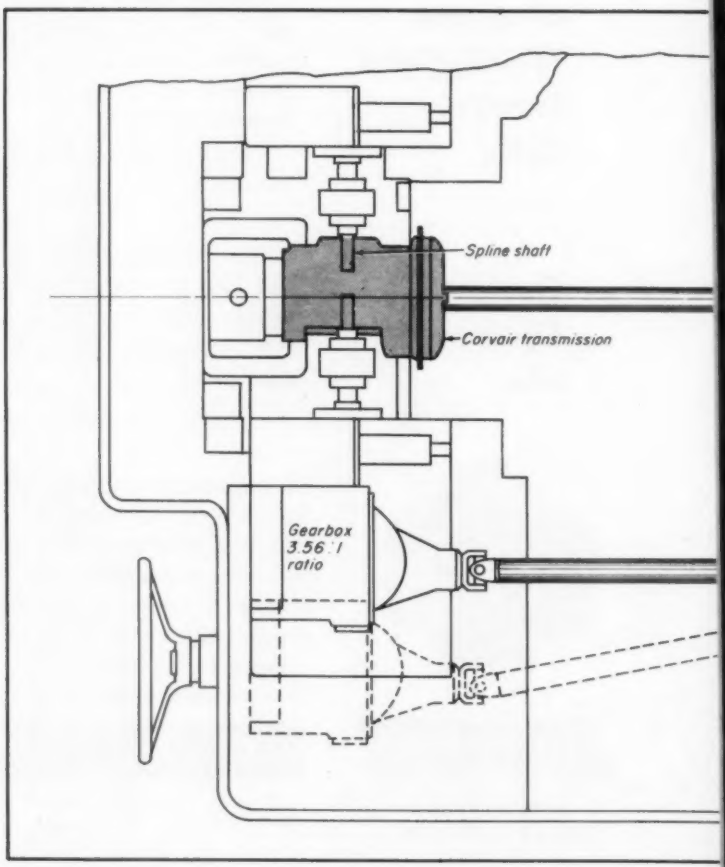
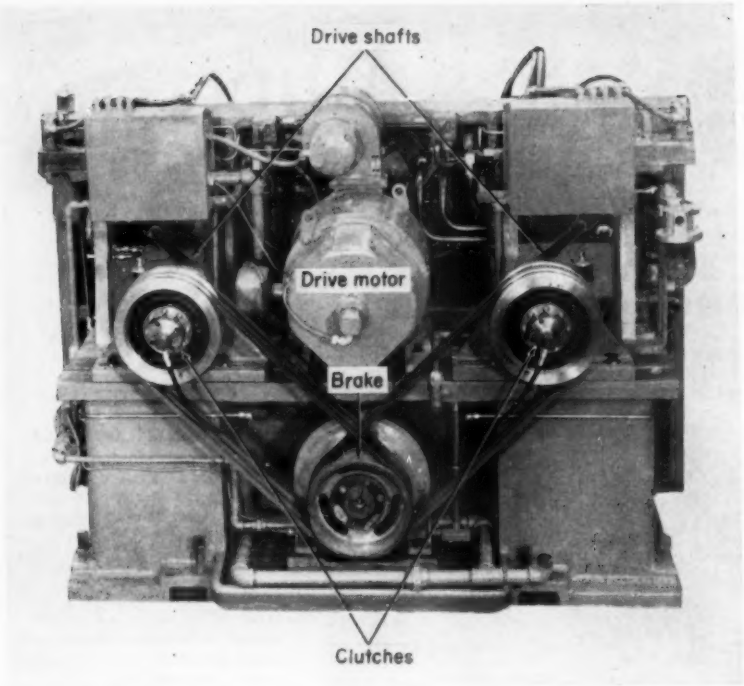



**DISSIPATING HEAT** through a water-cooling system, the dynamometer (brake) can be turned by either one, or both V-belt drives. The pneumatic clutches can be adjusted to apply from no-load to a maximum load to the transmission drive shafts. Simulating an automobile engine is a 30 hp, 230-vdc motor. Its speed range is from 1500 to 5000 rpm, forward or reverse.

# Rough trip for a Corvair transmission



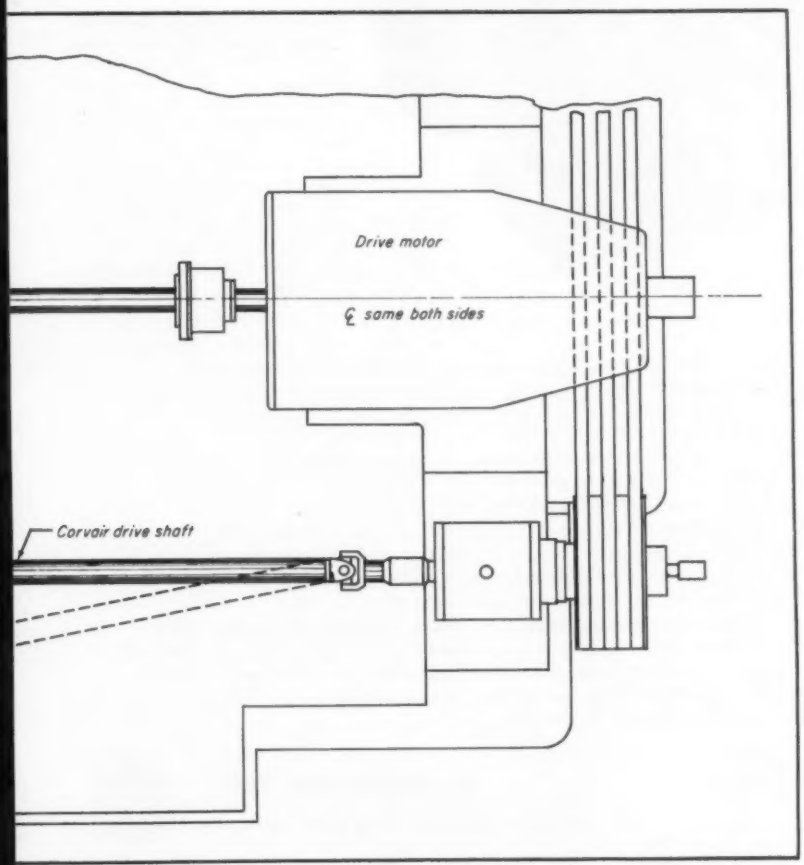



TRANSMISSIONS for Chevrolet Corvairs go through tests that simulate the most severe road conditions possible. The final test stand, built by F. Jos. Lamb, Co., Detroit, checks the automatic transmissions out in all ranges at varying speeds, forward and reverse, with and without loads.

The transmissions are roughly positioned in the stand by hand. Final positioning and clamping are done automatically. The "engine" is a variable-speed reversible dc motor. The "rear wheels" are an electric eddy-current brake.

During the test cycle (it takes just 6 min), each axle can be locked out to duplicate wheel spin, or wheel overload. Pneumatic clutches can vary the degree of slip at each wheel. Tachometers indicate input and output speeds, and a speed differential shows the efficiency of the transmission. Other gages record vacuum and oil pressure. The complete test cycle is controlled from a console.

A number of Chevrolet components are used in the test machine. Its output spline shafts, for instance, drive the eddy current brake through Corvair driveshafts. The right-angle gearbox that connects the spline shafts and these drive shafts is a modified Chevrolet differential. ◆




**HANDWHEELS** quickly slide the output shafts out of the way, when a new transmission is to be placed in the test machine (shown by dashed lines). Transmission under test can be run from a central transmission oil supply, or an individual oil reservoir.

*Engineering Data*

WINSMITH SPEED REDUCERS

# HOLLOW SHAFT WORM GEAR SPEED REDUCERS

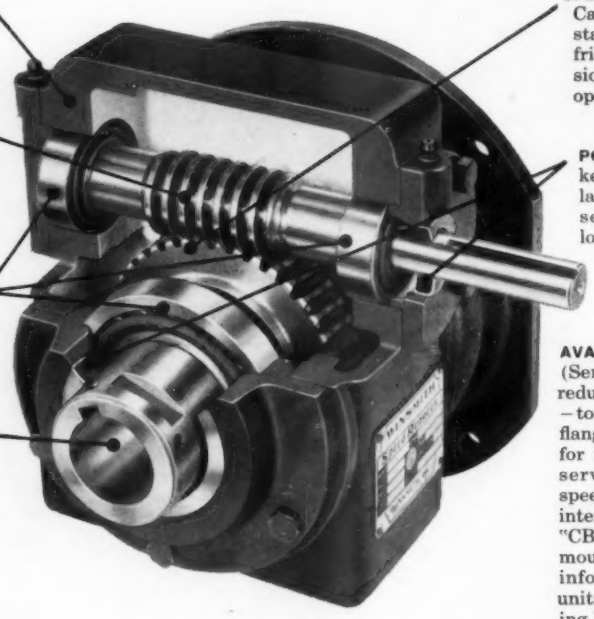
*single and double reduction . . . torque arm and flange mounted models*

**CAST IRON HOUSINGS** designed for high heat radiation. One-piece construction, close-grained gray iron for maximum strength and rigidity.

**CASE-HARDENED STEEL WORMS** cut integral with the shaft. Heat treated for close-grained tough core, carburized and hardened before grinding. Meet AGMA long-wear specifications.

**TAPERED ROLLER BEARINGS** for minimum maintenance, long bearing life and permanent shaft alignment. High radial and thrust load capacity.

**HOLLOW SLOW SPEED SHAFTS** in wide range of standard bore sizes and keyways. Mounts on shaft of driven machine *without bushings*—two external slots facilitate removal with standard wheel puller.



**SPECIAL BRONZE WORM GEARS** Cast to recommended AGMA standards. Low coefficients of friction and thermal expansion for cooler, more efficient operation.

**POSITIVE OIL SEALS** keep oil in, dirt out. Shafts lapped to micro-finish under seals for uniform contact, longer seal life.

**AVAILABLE** in single reduction (Series ST and SF) and double reduction (Series STD and SFD)—torque arm ("T" models) and flange mounted ("F" models)—for intermittent or continuous service. Hollow shaft slow speed assembly of "ST" series interchangeable with Winsmith "CB" and "CT" Series with foot mounted housings. For further information on these latter units, write Winsmith Engineering Department.

- *12 Models*
- *.041 to 8.82 H.P.*
- *Ratios 7½:1 to 4466:1*
- *Max. Output Torque 816 to 7678 in. lbs.*

Winsmith Hollow Shaft Speed Reducers cover a broad range of power transmission requirements for both single and double reduction drives. *Their worm gearing provides much higher reduction ratios than are possible in comparable size units using other types of gearing.* Winsmith Hollow Shaft models are designed for all applications where it is advantageous to mount the reducer on the shaft of the driven machine. They are compact, easy to install and require less space than conventional units. Their design and construction provide high shock load resistance; maximum thermal capacity without induced cooling; greater overhung capacity; and a high degree of standardization which eliminates excessive special application engineering.

Write today for complete information or call your nearest Winsmith Representative listed in the Yellow Pages. He is a technically trained expert who is always ready to help you with any speed reducer problem. For both standard and special power transmission applications, you'll find it pays to standardize on Winsmith.

**WINSMITH, INC.**

**204 Eaton Street, Springville, (Erie County), New York**

MEMBER OF AGMA

• • • Winsmith Speed Reducers are made by American craftsmen to meet American design and production standards.

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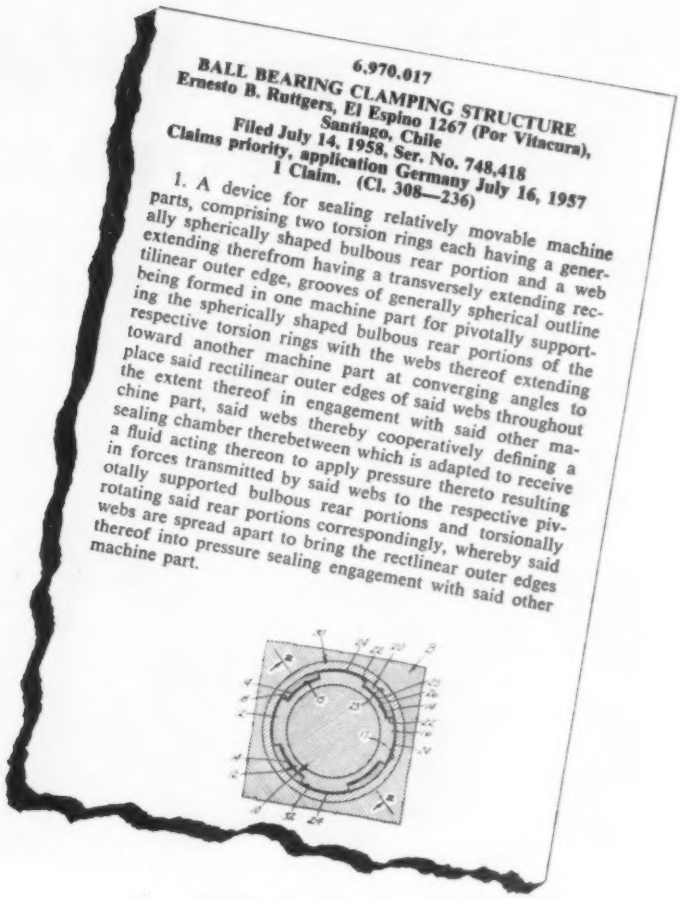
# Could a patent help YOU?



6,970,017

BALL BEARING CLAMPING STRUCTURE

Ernesto B. Ruttgers, El Espino 1267 (Por Vitacura), Santiago, Chile

Filed July 14, 1958, Ser. No. 748,418

Claims priority, application Germany July 16, 1957

1 Claim. (Cl. 308—236)

1. A device for sealing relatively movable machine parts, comprising two torsion rings each having a generally spherically shaped bulbous rear portion and a web extending therefrom having a transversely extending rectilinear outer edge, grooves of generally spherical outline being formed in one machine part for pivotally supporting the spherically shaped bulbous rear portions of the respective torsion rings with the webs thereof extending toward another machine part at converging angles to place said rectilinear outer edges of said webs throughout the extent thereof in engagement with said other machine part, said webs thereby cooperatively defining a sealing chamber therebetween which is adapted to receive a fluid acting thereon to apply pressure thereto resulting in forces transmitted by said webs to the respective pivotally supported bulbous rear portions and torsionally rotating said rear portions correspondingly, whereby said webs are spread apart to bring the rectlinear outer edges thereof into pressure sealing engagement with said other machine part.

"Is my new machine patentable?"

"How can I find whether someone else has solved my problem, with a patent?"

Most people, it turns out, don't have much idea of their patent rights. They have even less idea of how to set about obtaining one, and the Patent Gazette might as well have been written in Bantu.

Did you know that with all the research and development that has been going on in the last ten years, the number of new patents has not substantially increased?

The Patent Office has recently published two pamphlets to help inventors protect their ideas. This article is based, in part, on material contained in these publications.

Any new and useful process, machine, manufacture, composition of matter, variety of plant, or ornamental design for a manufactured article may be patented. However, patenting should not be confused with Copyrighting, which protects artistic works, or with Trademarks, which serve to indicate the source of goods. It is useless to try to patent a method, or a machine that will not work, or one that has no use, or an obvious improvement on an existing patent.

Patents are granted by the government, under the Constitution. They protect an invention for 17 years. A patent cannot be granted on an invention known or used by others, in this country, or described in a printed publication in this or a foreign country. Neither can they be granted on anything described, on sale, or in use, more than one year prior to the application for patent.

The grant gives the right to prevent, by due process of law, the manufacture, use, or sale of a patented item. The government cannot protect patents in foreign countries.

Many books have been published on patent law, although the Patent Office itself does not publish such textbooks. Nevertheless, the list of publications from the Patent Office is quite impressive.

Specifications and accompanying drawings of all patents are published on the day they are granted (every Tuesday). Copies may be obtained for $.25 each. The *Patent Gazette* is available from the Superintendant of Documents in Washington every Tuesday. It contains a claim and selected drawing for all patents issued during the week, court decisions in patent and trademark suits, a list of saleable patents, and general information such as changes in rules, etc. Single copies cost $.75, annual subscriptions $30.00.

The Office publishes an alphabetical list by state and city of *Patent Attorneys and Agents Available to Rep-*

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**COULD A PATENT HELP YOU?**

*resent Investors Before the United States Patent Office*, and also the more complete *Roster of Attorneys and Agents Registered to Practice before the United States Patent Office*. Among the many other publications are an *Annual Index of Patentees and Their Patents, Decisions of the Commissioner of Patents, General Information Concerning Patents, Trademarks*, and compilations of the laws governing them.

Any inventor may prepare his own application, file it with the Patent Office, and conduct patent procedures himself. But, the Patent Office warns, unless he is familiar with patent law, it is quite possible that he will obtain a patent that does not protect his invention.

Most inventors follow this advice, and employ the services of a patent attorney. To be listed by the Patent Office, a lawyer must be shown to be of good repute, good moral character, and he MUST NOT ADVERTISE HIS SERVICES. Advertisements in certain technical and mechanical magazines by individuals or organizations offering patent searches or promotion are not made by Registered Attorneys. The advertisers may not represent an inventor to the Patent Office, and cannot obtain a patent for him.

If you have a patentable idea, write it down. If possible draw sketches that clearly indicate how the idea differs from previous ones. Then, show it to two people, and when they understand it, have them sign and date it. Then, we suggest, you write to the Superintendent of Documents, Washington 25, D.C., asking for a copy of *Patents and Inventions, an Information Aid for Inventors*. Be sure to enclose $.15.

Even those without an invention can sometimes make use of Patent Office services. The search room in Washington contains immense amounts of technical information and suggestions for those seeking solutions to problems. A person may review the patents in the files himself, or he may engage a patent practitioner, who will send copies of those patents that are closely related to the problem. ◆

# Cleveland Speed Variator accurately controls paper web fed into Schriber Printing Press

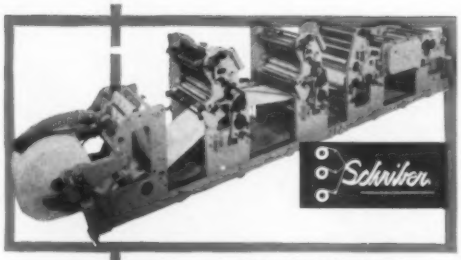
This new Rotary Offset Business Forms Press built by Schriber Press Company of Dayton, Ohio, was designed to provide printers with more hourly impressions—more daily output.

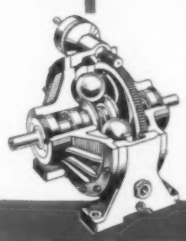
Its new infeed web tension control drive gives absolute constant tension from mill roll through a Cleveland Speed Variator-driven metering cylinder to press.

The Variator compensates for paper thickness—maintains constant surface speed of paper to the press—guarantees finished printing will always stay "in register".

A modified Cleveland Speed Variator providing increased precision within a limited ( ± 25% ) range was selected for this important function. This was accomplished by changing the curve of Variator's iris plate. Thus, this Variator allows exacting adjustment for paper machine tension—holds that tension or can easily be changed to another speed setting.

If your operations demand speed variation, be sure to get the complete "Cleveland Speed Variator Story". It's all in free Bulletin K-200 —write for your personal copy today.



**HOW IT WORKS**

Power is transmitted from input shaft to output shaft through alloy steel driving balls which are in pressure contact with discs attached to the two shafts. Relative speeds of the shafts are adjusted by changing the positioning of the axles on which the balls rotate (see cutaway view, left).

**Cleveland Worm & Gear Division**
Eaton Manufacturing Company
3273 East 80th Street • Cleveland 4, Ohio

CLEVELAND SPEED VARIATOR

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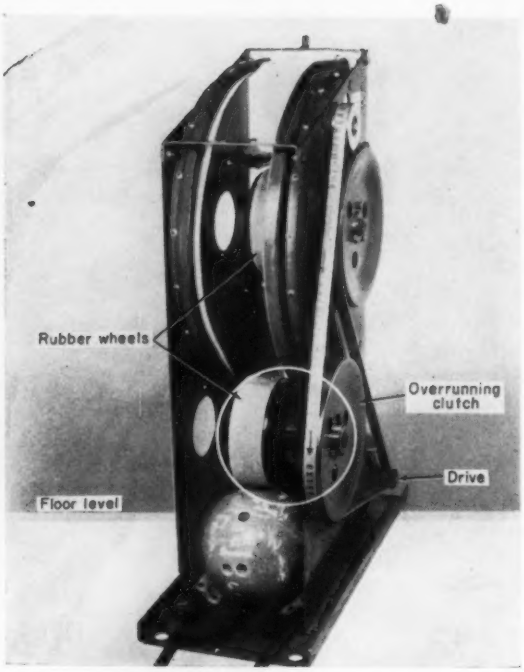
IDEAS

# Clutch clears the alley




**POSITIVE BALL RETURN** is assured by the automatic power lift, incorporating an overrunning clutch designed for the application. Clutch is hub-mounted by its outer race in pressed belt-driven metal pulley, while the inner race is keyed to a rubber-rimmed propulsion wheel. Clutch is 3⅝ in. in diameter, designed for a useful life of 13 million cycles, or about 15 years. Power supplied by a fractional horsepower motor, is transmitted by flat belts. Ball-driving wheel runs at 140 rpm.

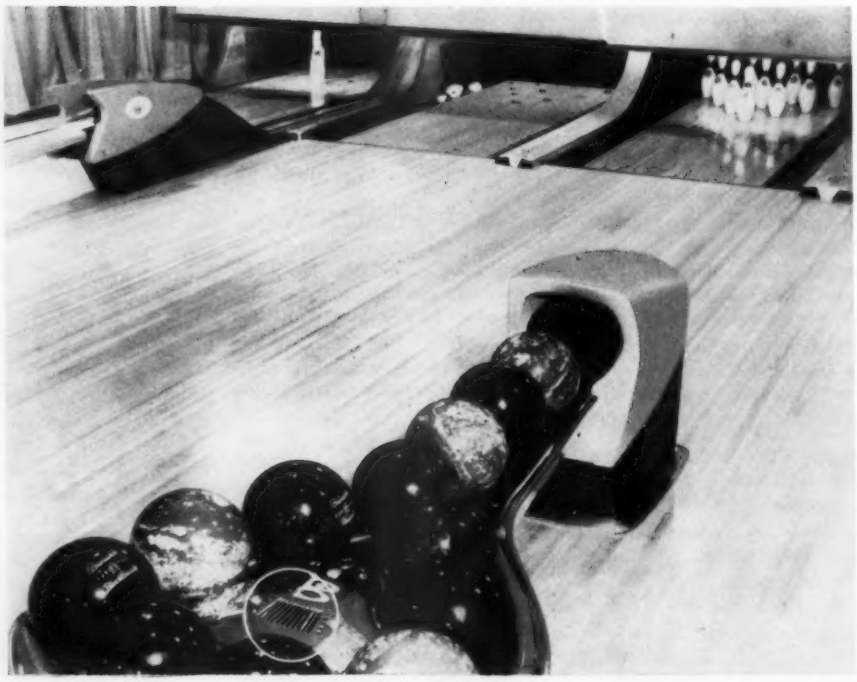
AN AUTOMATIC BALL-LIFT brings bowling balls back to their racks smoothly and quietly—underground.

Criticism of bowling alleys by serious bowlers spurred development of the positive action subway ball return by Brunswick Corp., Chicago, to overcome three drawbacks of previous equipment:

- Returning balls catch the bowlers eye, disturb their concentration
- Occasionally balls are damaged by jumping the tracks, and they interrupt the game
- Lightweight balls sometimes fail to clear the riser on the return track

In the improved system, balls return along an underground track, under gravity, to the power lift. At this point, they are travelling faster than the rubber propulsion wheel in the lift. As the ball meets the wheel, an overrunning clutch, produced by the Formsprag Co., Warren, Mich., disengages the rubber wheel from the drive pulley until the ball has slowed to the correct speed. It is then rolled around the first rubber wheel to a second, similar one, that lifts it up a chute to the ball rack.

The floor of the bowling alley is completely free of returning balls, and the tracks usually associated with them.



**RETURNING BALLS** underground allows the bowler to concentrate on his game. Perspective of the alley has been foreshortened.

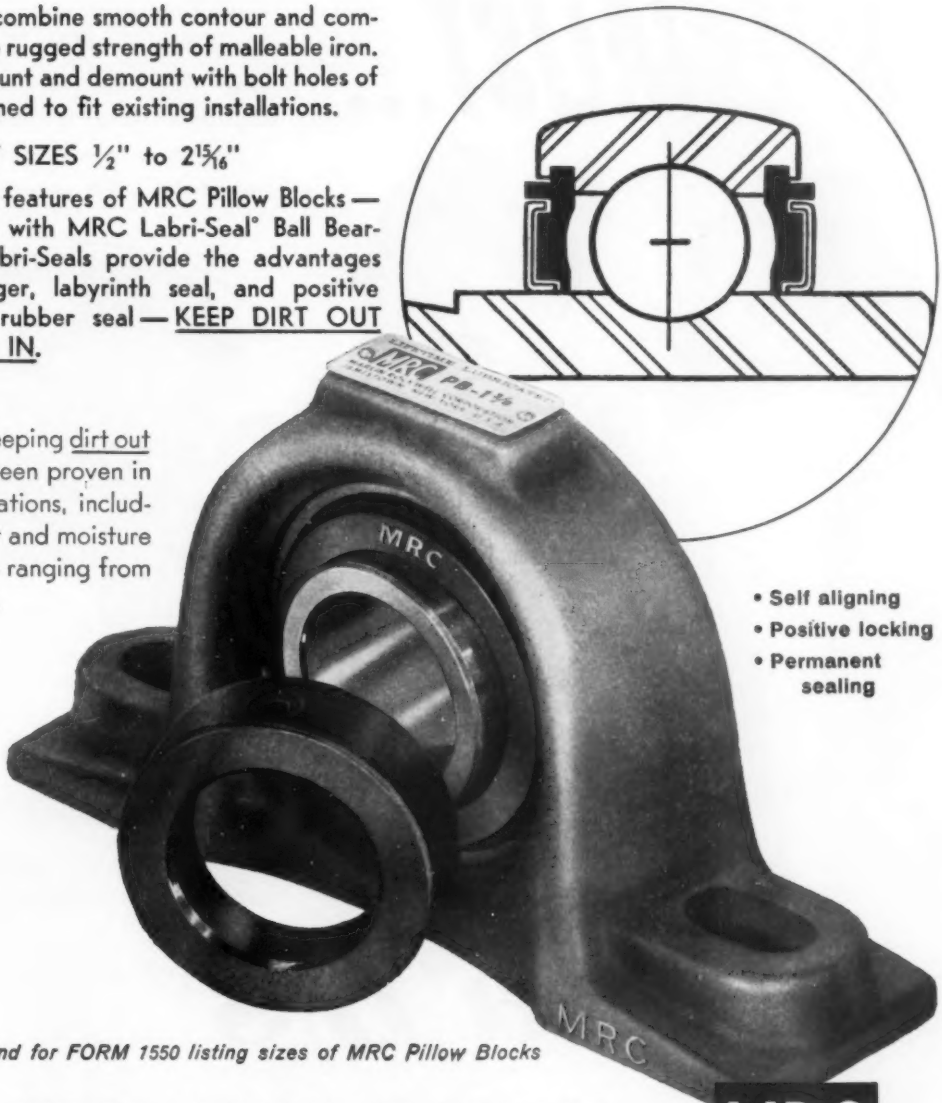
# MARLIN-ROCKWELL RELIABILITY COUNTS in PILLOW BLOCKS... with *Labri-Seal*® Ball Bearings

**MRC Pillow Blocks combine smooth contour and compact design with the rugged strength of malleable iron. They are easy to mount and demount with bolt holes of ample size — designed to fit existing installations.**

SHAFT SIZES ½" to 2 15/16"

**Besides the rugged features of MRC Pillow Blocks — they are equipped with MRC Labri-Seal® Ball Bearings . . . MRC Labri-Seals provide the advantages of a rotating flinger, labyrinth seal, and positive contact synthetic rubber seal — KEEP DIRT OUT — KEEP GREASE IN.**

Their efficiency in keeping dirt out and grease in has been proven in a variety of applications, including extremes of dirt and moisture . . . in environments ranging from –80° F. to +225° F.




- **Self aligning**
- **Positive locking**
- **Permanent sealing**

*send for FORM 1550 listing sizes of MRC Pillow Blocks*

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*OUR SALES and ENGINEERING DEPARTMENTS stand ready to serve YOU*

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Executive Offices: **Jamestown, N. Y.**

MRC BALL AND ROLLER *bearings*

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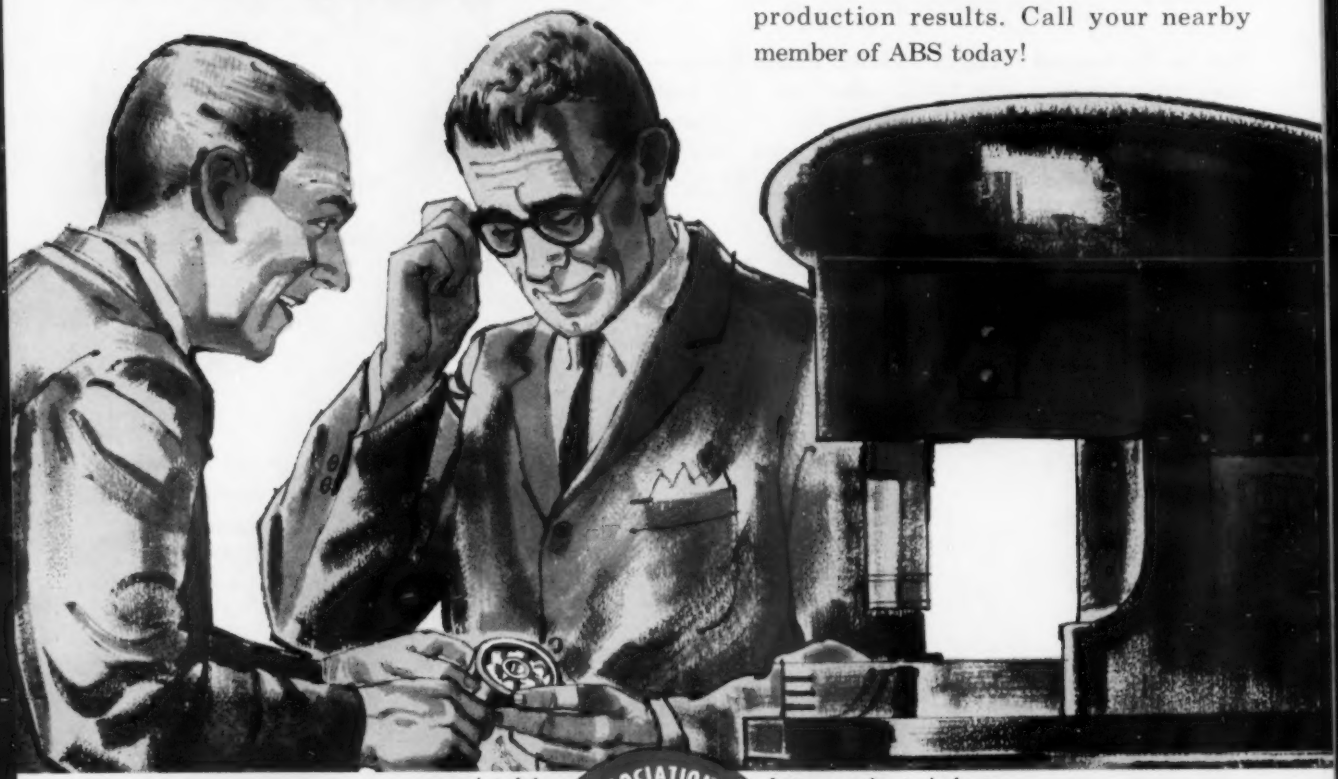
*"on the job" counsel is routine for your*

# BEARING SPECIALIST...

Sales engineers representing members of the ASSOCIATION OF BEARING SPECIALISTS are always "*on the job*" to make your production maintenance problems easier. Expert counsel and advice relating to the use of bearings and power transmission equipment is an extra service performed at no extra cost to you.

Look to your BEARING SPECIALIST for the finest American-made bearings and power-transmission parts . . . plus swift, intelligent technical service that reduces the possibility of breakdowns . . . and increases production results. Call your nearby member of ABS today!



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Volunteer Bearings
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**Denver, Colorado**
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**Duluth, Minnesota**
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**Detroit, Michigan**
Michigan Bearing
**El Dorado, Arkansas**
Coastal Plains Supply
**Eureka, California**
Bearings & Trans. Prod.
**Fairbanks, Alaska**
Bearing Eng. & Supply Co.
**Fargo, North Dakota**
Western Bearing & Supply
**Flagstaff, Arizona**
Semon Ind. & Welding Supply
**Glendale, Arizona**
Semon Industrial Supply
**Grand Junction, Colorado**
Bearing & Power Transmission Co.
**Grand Rapids, Michigan**
Michigan Bearing
**Green Bay, Wisconsin**
Libert Bearing
**Hibbing, Minnesota**
Minnesota Bearing
**Highland Park, New Jersey**
Bobker Bearings
**Houston, Texas**
Behring's Bearings Service
**Indianapolis, Indiana**
Hoosier Bearing & Trans.
**Jersey City, New Jersey**
Bobker Bearings
**Kansas City, Missouri**
Bearing Distributors
**Kearney, Nebraska**
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Industrial Bearing
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Bobker Bearings
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**Oakland, California**
Bearing Industries
**Odessa, Texas**
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Precision Bearing & Trans.
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Semon Bearing & Supply
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Bearing Distributors
**Pocatello, Idaho**
Western Bearings
**Port Arthur, Texas**
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**Spartanburg, South Carolina**
White Bearing
**Spokane, Washington**
Empire Bearing
**Tampa, Florida**
Miller Bearings
**Toledo, Ohio**
Binkelman Bearings
**Trenton, New Jersey**
Trenton Bearings
**Troy, New York**
Bearing Distributors
**Tucson, Arizona**
Semon Bearing & Ind. Supply
**Twin Falls, Idaho**
Western Bearings
**Tyler, Texas**
Bearing, Chain & Supply
**Westbury, New York**
Bobker Bearings
**Wichita, Kansas**
B-R-C Bearing
**Wilkes-Barre, Pennsylvania**
Keystone Bearing & Supply

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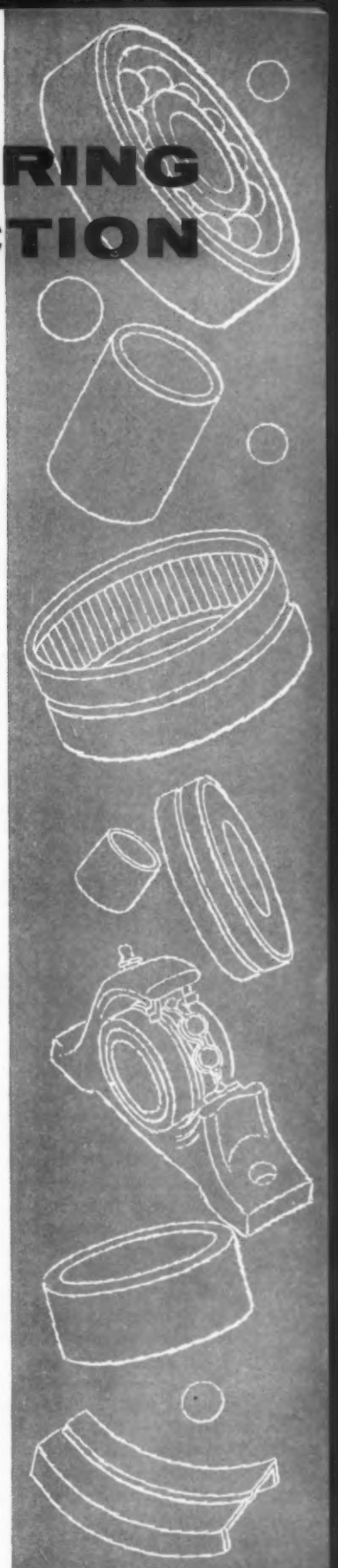
# BEARING SECTION



## *Bearing Business*

Two new McGill Bearing representatives are **Donald P. Braman** for the New York city area and **George E. Allen** for Chicago area. Both are graduates of Purdue University, and both were working in the engineering department prior to these appointments.

**Cottingham Bearings and Service, Inc.,** Dallas wholesale distributor, has been appointed stocking distributor for the pressure-can line of lubricants made by the Whitmore Mfg. Co. in Cleveland.

**The election of Horace B. Van Dorn** as vice president in charge of engineering has been announced by The Fafnir Bearing Company. At the same time the company announced that **Howell L. Potter** will assume Van Dorn's former post as director of engineering.

**Research study on large diameter bearings.** The first complete research study on large diameter anti-friction bearings has been released by the Kaydon Engineering Corp., Muskegon, Mich. The 227-page book is titled "Feasability Study of Large Diameter Anti-Friction Bearings for Radar Antenna Applications," and is available from Kaydon at $25 a copy.

Developed under an R&D contract from MIT, the study summarizes the present state of large bearing design, gives formulas and specific data on all types of ball and roller bearings.

**Vibration limits bearing performance** as the operating speeds of production machinery and mechanical products are increasing. The amount of vibration present in the mechanism has become an important factor in determining not only performance, but also longevity. Vibration negligible at a slow speed becomes destructive at high speeds due to the fact that these forces increase as the squares of the speeds.

**Eugene G. Hart,** President of International Research & Development Corporation said that engineers daily bring vibration problems to his company. "Today," said Mr. Hart, "vibration tolerances in terms of displacement are being included in the routine inspection of preventive maintenance programs. Many engineers have come to the conclusion that vibration is the earliest indication of misalignment and other causes of deterioration of machine condition."

**LARGEST BEARING** of its kind yet produced by the Rollway Co., this three-stage thrust bearing is 34-in. OD, with a 17-in. bore and 25 ½-in. long.

# Giant bearing absorbs triple thrust

A TANDEM THRUST BEARING almost three feet in diameter will support the main shaft of National Rubber Machinery's new 15-in. plastic extruder. It has three roller assemblies, and six precision thrust plates matched to equalize the loading on each stage.

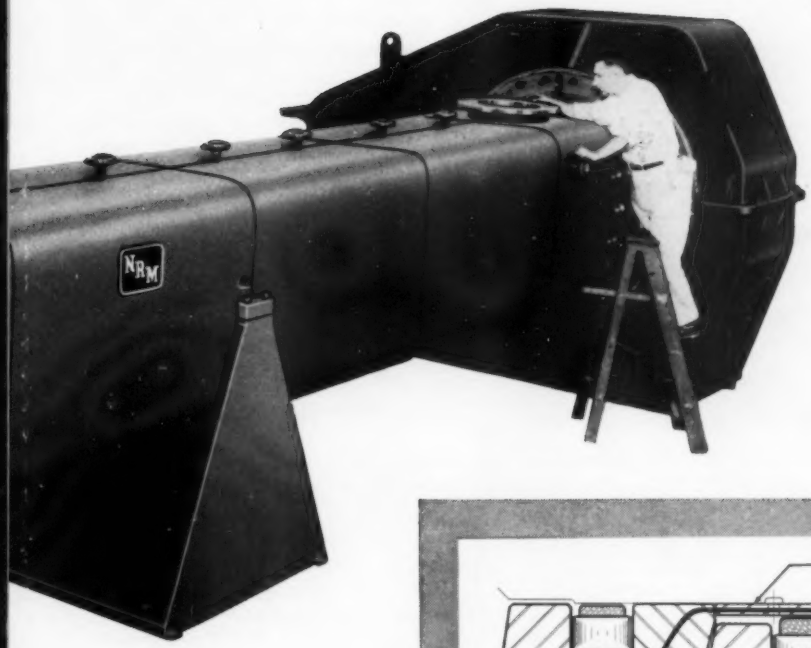
Each of the roller assemblies is designed to take approximately ⅓ of the total thrust load through cantilevered thrust plates. "This even distribution", says Rollway Bearing Co., Syracuse, N. Y., "is dependent on accurate correlation of the thickness of each of our bearing's four spacer sleeves."

Despite the immense size of the bearing, its design and operating geometry call for precision tolerances on all components. Its crowned rollers are ground to a 4 micro-inch surface finish. The bore size may not vary by more than 0.002-in., and the bearing tolerance is 0.003-in. Plate surfaces are square within 0.001-in.

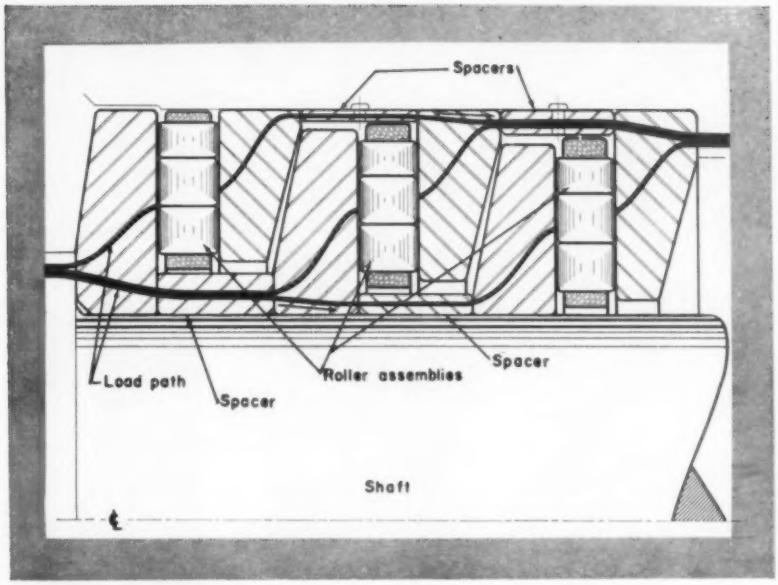
Because the bearing was designed for horizontal installation, the possibility that the thrust plates between the bearing housing and the rotating shaft would restrict lubricant flow had to be considered. Rollway designers avoided this problem by locating the roller assemblies at the outside diameter of the thrust plates. This arrangement has the additional advantage of minimizing the force on the roller retainers, which in turn, extends the life expectancy of the bearing.

The tandem design of the bearing was arrived at as a solution to the problem of restricted housing space. Space was available along the shaft, but the housing diameter had to be kept to a minimum. The 2¼ ton bearing has a thrust load capacity of 4,630,000-lb at 40 rpm. Its three 34-in. OD thrust plates are stationary in the housing. The inner spacer sleeves and three rotating thrust plates are ground to slip-fit on the shaft.

The bearing is so designed that sections, in single and two-stage arrangements, can be used to meet lesser load demands. Or, in the case described, components may be replaced without renewing the whole bearing. In many cases, components from such instal-



**WITH A TOP CAPACITY** of 6,500-lb, National Rubber Machinery's 15-in. thermoplastics extruder needs 800 hp.




**CROSS-SECTION** of the bearing indicates how the load is transmitted through it. Also clearly indicated is the low profile of the bearing.

lations are interchangeable—which can considerably reduce a spare parts inventory.

An example of the use of the bearing for multiple load requirements is the line of extruders. The fifteen inch extruder uses the three-stage bearing. The twelve inch extruder only requires the first and second stages of the bearing. A still smaller extruder with even lower loads uses only the first stage of the same bearing. A comparison of the thrust capacities of the three machines is tabulated below.

**THRUST CAPACITY OF 3 EXTRUDERS**

| rpm | 3-stage, lb | 2-stage, lb | 1-stage, lb |
|---|---|---|---|
| 80 | 3,670,000 | 2,503,000 | 1,637,000 |
| 60 | 4,043,000 | 2,753,000 | 1,801,000 |
| 40 | 4,630,000 | 3,155,000 | 2,062,000 |

Other typical uses for the three-stage bearing include oil-drilling swivels, large lathes, and high capacity pumps.

The bearing's rollers are designed to withstand operating temperatures of 300 F. Made of SAE-52100 steel, they are through-hardened to 59-63 Rockwell C. They are spaced with machined bronze retainers in sets of three: two 2-in. long and one 1½-in. long rollers in each slot, staggered to equalize wear distribution. The first, second, and third stage rollers have 24, 22, and 21 slots respectively.

Altogether, the bearing uses 201 rollers, each 2½-in. long, crowned, and finish-ground to a large radius at each end. This grinding prevents high stress build-up that occurs between two cylindrical surfaces in rolling contact. ◆

**WORKERS** wear lint-free clothing, and air showers in the entrance air-locks remove many minute traces of dust. All particles larger than a few microns are filtered from the incoming air, and a central vacuum system helps remove stray dust.

**FINAL CHECK** on every bearing component is a minute visual inspection. Ball bearings as small as 5/32 in. in diameter are produced in this plant.

**ULTRASONIC CLEANING** makes more reliable bearings, says the Barden Co. They consider the $19,000 spent on cleaning equipment highly worth while.

# Ultrasonics: cleaner of bearings

EVEN SPECKS OF DIRT that are barely visible under a microscope can ruin a bearing.

When the bearings are destined for guidance systems, in aircraft, ships, and missiles, they must be especially fail-proof. Malfunction of a single gyro bearing in a guidance system can causes dangerous navigational errors. Present rigid reliability specifications limit bearing failure to 1 in 100,000. Expected improvements in cleaning and fabrication techniques give reason to believe the reliability standards may be tightened to reduce even this slight chance of failure.

For Barden Corp., ultrasonic energy removes the almost invisible particles left behind by lapping and grinding operations. Previously, tiny bearing components were individually brushed and buffed by hand. The method was lengthy and tedious, and didn't always remove all the particles.

Now, a few seconds in a Sonogen cleaning tank, and the bearing components are microscopically clean. In the tank, ultrasonic agitation of the cleaning liquid dislodges traces of lapping compound, shop grit, grinding particles, and machine chips.

Millions of tiny pressure cells are rapidly built-up and collapsed by ultrasonic energy. This phenomenon, called cavitation, blasts dirt and grease from anything immersed in the bath in seconds. The only sign of effort is a faint hiss and a few ripples on the surface of the bath.

In the Sonogen system, a sonic generator produces high-frequency electric vibrations. Ceramic transducers mounted on the walls of the cleaning tank convert the electrical energy to 38,000 cps mechanical vibrations.

For high-production, manufacturers use quick drying organic solvents. Slower-drying, water-based solutions are more efficient, though, and they are used for low quantity runs, and special cleaning problems. One disadvantage of water-based solutions is the marks they leave on dry surfaces. Developers are working on ways to prevent this, and it seems likely that the problem will soon be solved.

Cleaning solutions have to be degassed before use. Ten to fifteen minutes of operation degasses aqueous solutions. However, even a full day of operation won't degas chlorinated solvents. They must be distilled once a day and operated with gas-free condensate.

Because of the cleanliness requirements, the bearings are finally assembled in white rooms, sealed off from the rest of the plant by windows and air-locks. Then, packaged in polyethylene bags, they leave through the air-lock window shown in the top photograph. ◆

**bearings and parts**

Take the simple, sure, direct route to lower manufacturing and maintenance cost. Design into your product Bunting Standard Stock Bearings. You avoid inventory investment, delays, confusions, production problems by the immediate availability in small or large lots, from local distributors all over America, of hundreds of different stock sizes of completely finished cast bronze and sintered bronze bearings and bars, aluminum bars and Nylon shapes.

**Special design bearings not obtainable from stock can be procured immediately at low cost from Bunting fully equipped machine shops in five industrial centers. The wide range of sizes of Bunting Stock Cast Bronze and Sintered Bronze Bearings makes the alteration of a stock item to a special bearing easy and economical. Bunting Cast Bronze, Sintered Bronze, Aluminum Bars and Nylon shapes provide the materials for special requirements which cannot be made from stock bearings. Your local Bunting Distributor can arrange for such work.**

A large staff of bearing engineers in the field stands ready to assist in the use of these Bunting stock products and in the designing of bearings or components for extraordinary applications. Two big, modern plants assure ample production capacity at all times for bearings and parts made from all modern metals and materials.

**See Bunting's complete catalog, Sweets Product Design File 11C/BU or ask for Bunting's General Catalog, Form 158; Nylon Catalog, Form 32; Technical Handbook on Bunting Nylon, Form 33; The Technology of Bunting Aluminum, Form 46; Engineering Handbook of Powder Metallurgy, Form 1; Bunting Machine Shop Service, Form 4.**

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BEARINGS, BUSHINGS, BARS AND SPECIAL PARTS OF CAST BRONZE, SINTERED METALS, ALUMINUM ALLOYS AND NYLON

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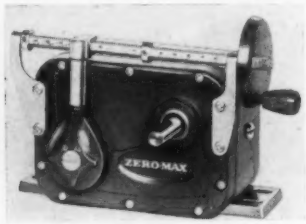
# PRODUCT NEWS

**To get complete information on these products, use the Reader Service Cards bound into this issue.**

## Optional screw control

Designed to convert over 250 types of Zero-Max drive from standard lever to screw control, this calibrated control mounts on either left or right side. Forty-seven turns



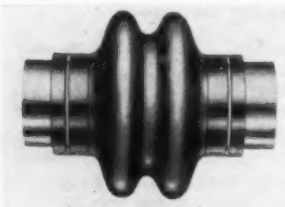

of the handwheel cover from zero rpm to maximum speed setting on the drive. Models with torque output over 100 in. lb must be factory converted.

*The Zero-Max Co., Minneapolis, Minn.*

Circle **200** on Reader Service Card

## Booted universal joints

Booted universal joints for severe service are fitted with oil resistant Neoprene covers prepacked with grease. The cover or boot is held in place by snap wires, and does not joint, allowing operation through a full 40° working angle.



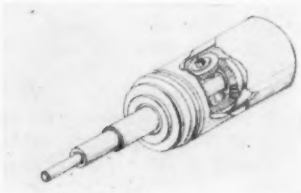
Both standard and heavy duty types—standard from ⅜ in. to 2½ in. OD with static torque range from 220 to 30,000 in.-lbs, hp from .35 to 120 and speeds to 1500 rpm. Heavy-duty joints come in the same OD's, with static torque range from 540 to 48,000 in.-lbs, hp from .86 to 230 and speeds to 1750 rpm. Construction is case-hardened stainless steel alloy, with an option of various grades of steel and bronze bushings around the pin for some sizes in both types. Boot OD depends on joint size, ranging from 1¼ in. to 5½ in.

*Lovejoy Flexible Coupling Co., Chicago, Illinois.*

Circle **201** on Reader Service Card

## Single-end enclosed differential

The T753 differential is made in sizes 5, 8, 11, 15 and 18 and features high speed rotation, minimum backlash, low break-away torque



and maximum rotational torque output. Precision ball bearings throughout, aluminum and stainless steel construction. Prices between $140 and $150 each, from stock.

*Sterling Precision Corp., Components Div., Port Washington, N. Y.*

Circle **202** on Reader Service Card

## Electric brake

The 46,000 Series brake operates on ac and is flange mounted. It comes completely enclosed in a housing with torque ratings of 500, 750, and 1000 ft. lbs. Offers unusually high thermal capacities and extremely low $WK^2$. Unitized construction—the mechanism is attached to a single plate for easy maintenance. Need for readjustment to compensate for lining wear can be seen from outside the en-


ASARCON

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# ASARCON

## custom shapes and forms in any lengths you need

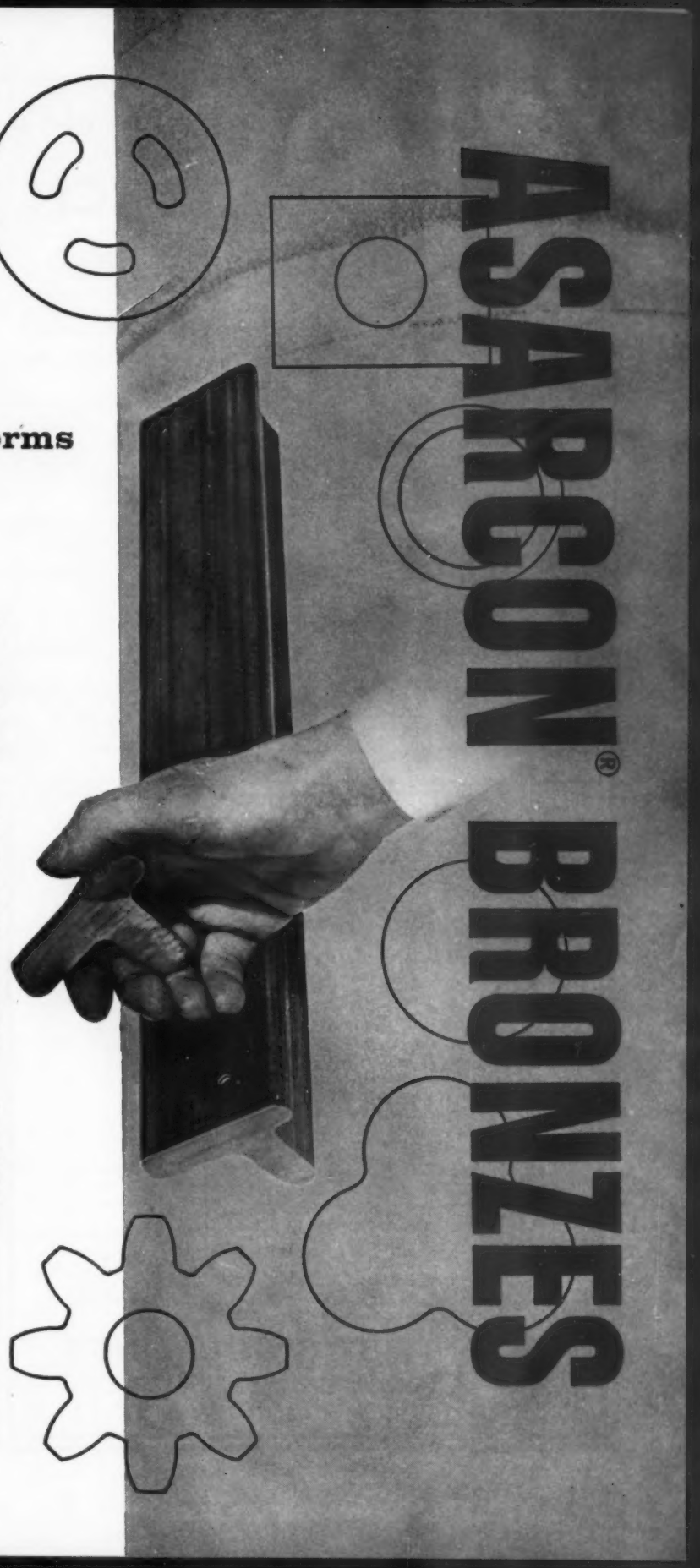
Asarcon continuous castings give you an extremely wide variety of shapes and forms in standard bronze alloys. They will increase your production rates and lower your costs, because: you get the shape you want in any length you need up to 20 feet. This permits machining on automatic screw machines and other high-speed equipment.

Continuous casting of Asarcon bronzes raises fatigue characteristics of standard alloys 33 to 100%, increases impact strength from 15% to more than double that of identical alloys cast other ways, adds materially to tensile, yield strengths and hardness. Asarcon 773 (SAE 660) bearing bronze in solids, rods and tubes is immediately available from stock in your choice of more than 260 sizes up to 9″ O.D. and lengths up to 105″. A wide variety of other special alloys, shapes and sizes produced to order.

For complete data on Asacon continuous-cast bronze, write Continuous-Cast Department, American Smelting and Refining Company, Perth Amboy, N. J.; Whiting Ind., or 120 Broadway, New York 5, N. Y.; or call your nearby Asarcon distributor.

ASARCO

Circle **2** on Reader Service Card



Circle **13** on Reader Service Card

***What some folks won't do to use a***

# CONWAY CLUTCH

***There are two kinds of clutches:***

## CONWAY CLUTCHES

**and those that wish they were Conways.**

• • •

Evidence the fact that the Conway STATIONAIRE (illustrated) has been copied. Oh well, imitation is the sincerest form of flattery.

• • •

Tsk, tsk . . . don't tell our competitors but STATIONAIRE has gone HYDRAULIC! Really, we don't know what the clutch industry would do without us.

**WRITE FOR BULLETIN**

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**The CONWAY CLUTCH COMPANY**

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*What makes the first gear-type coupling still first choice?*

*Check design* . . . and you'll find Fast's Couplings (the original gear-type couplings) are superbly engineered, ruggedly built, smoothly running units designed to outlast the machines they connect.

*Check completeness of line* . . . and you'll find Fast's Couplings come in a complete range of sizes and types for shafts from ½" to 32" and larger.

*Check service* . . . and you'll find Fast's Couplings are backed by expert help from experienced field engineers . . . while outstanding stock facilities throughout the country insure speedy delivery of your coupling orders.

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*Check Fast's* for your coupling needs today.

KOPPERS COMPANY, INC., 904 Scott St., Baltimore 3, Md.

KOPPERS®

***FAST'S COUPLINGS***

**Engineered Products Sold with Service**

Circle **54** on Reader Service Card

# PRODUCT NEWS

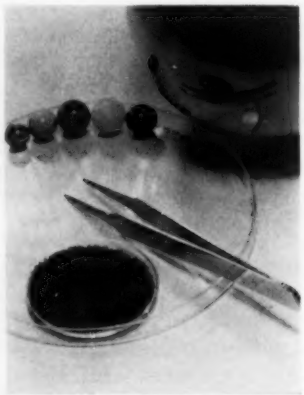
closure. Manual release-automatic reset is included. Standard motor shaft lengths, or thru shafts. Ductile iron construction and corrosion protection suit the brake for use on ships. Floor mounted models are also available.

*Stearns Electric Corp., Milwaukee, Wis.*

Circle **203** on Reader Service Card

## Precision balls

Precision balls, in both prototype and production quantities, are made of materials such as boron carbide, titanium diboride, glass-filled teflon, Indox I, irradiated polyethylene, ferrites, synthetic rubies and sapphires, tantalum, titanium carbide, and high density aluminum oxides. Balls of these



materials can be used where loads and temperatures are extreme; or where corrosion resistance, magnetic or non-magnetic qualities, dielectric properties, or controlled density are important. Company also furnishes balls of high purity metals for research, in many sizes, tolerances or surface finishes.

*Industrial Tectonics, Inc., Ann Arbor, Mich.*

Circle **204** on Reader Service Card

## Compact calculator

The Type 2 Curta calculating machine has a capacity of 11 digits on the keyboard, 8 digits on the indicator dial and 15 digits (corresponding to 999 trillion) in the answer dial. Made of stainless steel and high grade anodized aluminum alloys, it is 2 1/16-in. in diameter by 3⅝ in. high (about the size of a fishing reel) and weighs 12 ounces. It is noiseless, corrosion-

proof, does not require an external power supply. Main barrel assembly contains the 11 digit horizontal keyboard with color-coded setting knobs and movable white decimal markers. A driving axle with a step

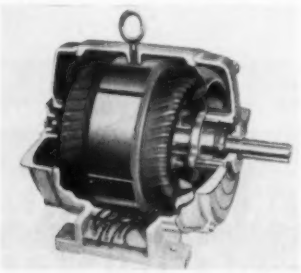
drum and reciprocal cog system passes through the center of the machine and is actuated by a short radius operating handle. The knurled carriage contains the revolution counter, result dial and additional decimal markers. A single lever will clear the two dials, either simultaneously or individually. A continuous tens transfer and reversing lever permits short-cuts in multiplication, division, addition, subtraction and in multiple operations involving cubes, roots, percentiles and trigometric functions. Automatic stops prevent errors in operation or damage from overspeeding.

*The Curta Company, Van Nuys, Calif.*

Circle **205** on Reader Service Card

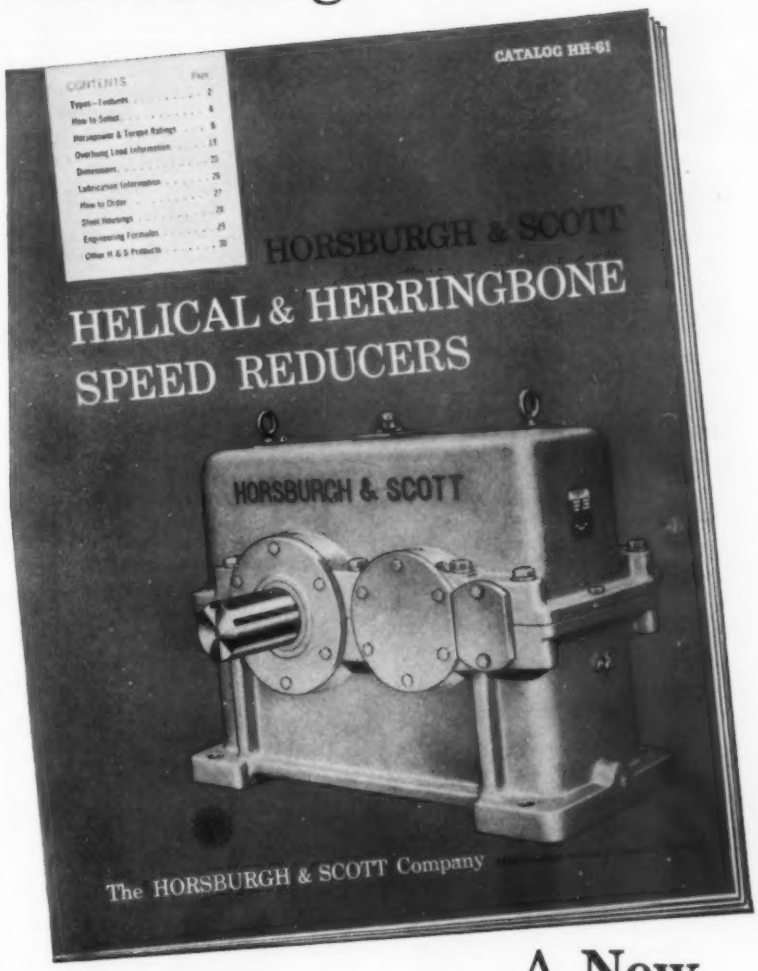
### *Capsular motor insulation*

Encapsulation for random-wound ac induction motors offers added protection against moisture, oils, chemicals and abrasives, providing longer life for the open motor.



Stators are encapsulated in heat-resistant plastic resin that seals end-coils and fills spaces between wires in the stator slots with a protective sheath. Encapsulating ma-


Introducing . . .

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Write for **Catalog HH-61**—on your company letterhead, please.

*Let our engineering staff give you prompt assistance with your enclosed gearing requirements.*

The HORSBURGH & SCOTT Co.
5112 Hamilton Avenue • Cleveland 14, Ohio

Circle **23** on Reader Service Card

INSTANT

SOURCE

Charles Bond's large factory and distributor stocks provide an ideal "instant source" for Power Transmission Equipment for today's replacement and design applications. Frequently, the use of a Bond stock component eliminates the need to create a new component—with attendant delay and expense. When required Bond does create special units to your specifications.

Remember Bond—a leader in the power transmission field for three quarters of a century.

AGMA MEMBER

SEE YOUR NEAREST BOND DISTRIBUTOR

or check with Charles Bond Co. for: speed reducers—gears—flexible couplings — sprockets and chains—universal joints—collars —pillow blocks.

Write for Catalog No. 100

CHARLES BOND COMPANY

617-23 Arch Street, Phila. 6, Pa.

Circle **10** on Reader Service Card


# PRODUCT NEWS

terial has high dielectric strength over a wide temperature range without cracking, crazing or breaking the bond between the plastic compound and stator laminations or windings. Supplied on open drip-proof motors, 445 U-frame sizes and smaller–600 volts and below, including special electrical and mechanical features.

*Louis Allis Co., Milwaukee, Wis.*

Circle **206** on Reader Service Card

## *Thyratron and diode tubes*

New thyratron and diode tubes predict tube failure 300 hours ahead of time by changing color from normal blue to neon red before failure. Standard on Reliance

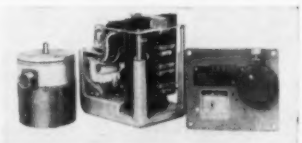
V°S Drives, the tubes can be used on many makes of drive or process employing thyratron or diode tubes. Available in 2.5 and 6.4 amp. rating–pin or lug base.

*Reliance Electric and Engineering Co., Cleveland, Ohio.*

Circle **207** on Reader Service Card

## *Position control*

The HH-50 is high-accuracy positioning control with resolutions of one part in 30,000 or better. It in-



cludes position sensor (or combination actuator and sensor) shown left; a solid state printed circuit amplifier and the digital readout position setter shown right. The amplifier may drive a standard Jordan Shaftrol rotary actuator or Lineatrol linear actuator, or other

Save $ $ $ $

ATLAS UNIVERSAL JOINTS

Balanced to operate without vibration at all speeds. Short, stubby jaws give maximum resistance to spread. Larger diameter joints fitted with big grease reservoir. Standard alloy steel joints in fifteen sizes for all requirements. Also made in Bronze, Monel and other special metals.

Universal Slip Shafts a specialty.

WRITE for illustrated catalog giving data and specifications.

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GRAY & PRIOR

THE GRAY & PRIOR MACHINE CO.

607 WINDSOR ST.
HARTFORD 1, CONN.

Circle **55** on Reader Service Card

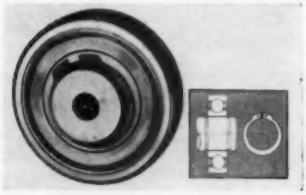
electric or hydraulic drives. The amplifier output may be solid state or from relays. A cross-over circuit provides fast traverse and transfer to slower speed as preset position is approached.

*Jordan Controls, Inc., Milwaukee, Wisconsin.*

Circle **208** on Reader Service Card

### Heavy-duty retaining ring

Series 5160 heavy-duty retaining ring is designed for assemblies where loading is extreme. The ring



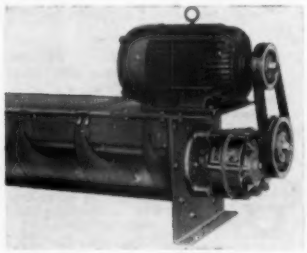
has high thrust and impact resistance and provides a shoulder sufficiently high to retain components having large corner radii or chamfers. Eleven sizes available for shafts from .473 to 2.0 in. dia. Standard material is carbon spring steel; standard finish is oil dip. Other materials are stainless steel and berylium copper (for shafts from .473 to 1.378 in. dia.)

*Truarc Retaining Rings Div., Waldes Kohinoor, Inc., Long Island City, N. Y.*

Circle **209** on Reader Service Card

### Short screw conveyor drives

Series 100 drives for short conveyor flights and low hp jobs are offered in two speed ratios: 8:1 for up to 6 hp at 225 rpm, and 18:1 for up to 3.8 hp at 100 rpm. Drive



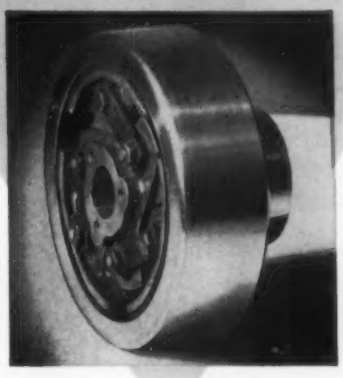
consists of a double reduction speed reducer with packing gland and driving shaft which mounts on a trough end. AGMA-standard, heat-treated helical steel gears and pinions. Packing gland is adjustable from the outside, takes standard packing and may be inspected by sight. Slotted holes in the flange


CLUTCHES FOR POWER CONTROL DESIGNS

THE NEW HILLIARD-TWIFLEX
Centrifugal Coupling

1
AUTOMATIC
smooth starting with protection against overload shock.

2
FLEXIBLE
in all directions without any loose joints.



3
ADJUSTABLE
to exactly suit the operating conditions.

4
SIMPLE CONSTRUCTION
and easy assembly even in blind installations.

**HILLIARD-TWIFLEX Centrifugal Couplings provide automatic shockless power transmission and trouble-free operation even under relatively great misalignment without any lubrication whatsoever.**

**They are being used very successfully in the drive of compressors — agricultural sprayers — mixers — conveyors — generators — fans and blowers — pumps — hammer mills — crushers — winches and hoists — refrigeration equipment — textile machinery — and wherever smooth, efficient operation is needed.**

**Tests in a variety of installations for over five years prove the Twiflex is the practical solution to many drive problems.**

WRITE TODAY FOR BULLETIN CE-3 WITH COMPLETE INFORMATION.

★ CONSIDER AUTOMATION-INVESTIGATE THESE PRODUCTS

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**SINGLE REVOLUTION CLUTCHES** for automatic accurate control—electrical or mechanical—or intermittent motion, indexing, cycling and cut-off. Ask for Bulletin 239.

**OVER-RUNNING CLUTCHES** for automatic instantaneous engagement and release on two speed drives, dual drives and ratchet or backstop action. Ask for Bulletin 231.

**SLIP CLUTCHES** for overload protection, or constant torque and to provide constant tension and permit speed variation on rewind stands. Ask for Bulletin 300.

THE HILLIARD Corporation
MANUFACTURING CLUTCHES FOR OVER 50 YEARS
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IN CANADA: UPTON • BRADEEN • JAMES, LTD.

Circle **22** on Reader Service Card

SIMONDS

- INDUSTRIAL CUT GEARS

LARGE OR SMALL HEAT TREATED OR PLAIN

SIMONDS has over 60 years' experience in cutting quality industrial gears. We can supply any type of gear in cast or forged steel, gray iron, bronze, Meehanite, rawhide or bakelite in a full range of sizes adaptable to the material. Also heat-treated, case or flame hardened gears of carbon or alloy steel. Send us your requirements for quotation.

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GEAR CUTTING

SIMONDS' facilities can produce any type of custom gear from your blanks if you prefer. Same quality . . . same prompt service.

QUALITY GEARS FOR OVER 65 YEARS

SPUR GEARS
BEVEL GEARS
MITRE GEARS
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RACKS PINIONS

Also stock carrying distributors of Ramsey Silent Chain Drives and Couplings; and industrial V-belts.

MEMBER OF AGMA

THE SIMONDS GEAR & MFG. CO.

LIBERTY at 25TH PITTSBURGH 22, PA.

Circle **39** on Reader Service Card


# PRODUCT NEWS

of the reducer so it rotates for quick V-belt adjustment. Drive shaft is mounted in a steel sleeve; built-in puller so you can change the shaft without opening the reducer.

*Dodge Mfg., Corp, Mishwaka, Ind.*

Circle **210** on Reader Service Card

## *Multi-purpose lubricants*

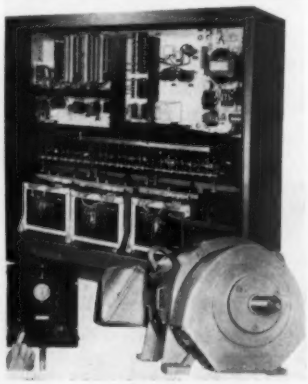
A line of molylubricant greases and oils called B-F Molylubricants (made with molybdenum disulphide), are stable under temperatures from −15 to plus 450 F. Will not melt, or emulsify with water; unaffected by freezing, salt water or most acids and alkalis. Lubricant forms a solid film on metals or alloys without build-up or free sulphur corrosion.

*Chemical Products Div., Bridgeport Fabrics, Inc., Bridgeport, Conn.*

Circle **211** on Reader Service Card

## *Variable speed drive*

The V°S Statatron is a static-powered drive for wide range variable speed from in-plant ac circuits, available from 1 to 200 hp. Consists of three basic components: the Super "T" dc motor, the operator's panel and the control cabinet. Uses silicondiodes and saturated reactors to rectify the current from ac to controllable dc. They work in combination with the transistorized power exciter to supply variable voltage. No motor generator, vibration-less operation because there's no rotating power unit.

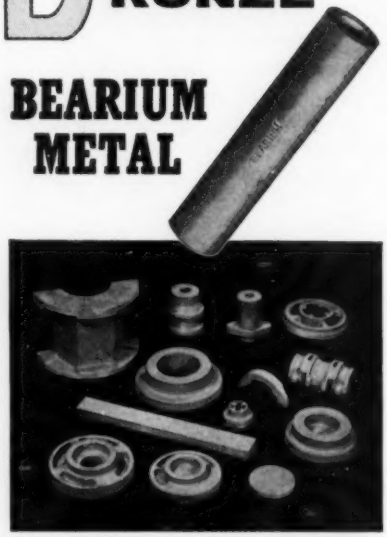


*Reliance Electric and Engineering Co., Cleveland, Ohio.*

Circle **212** on Reader Service Card


Your BEST BUY in BEARING BRONZE

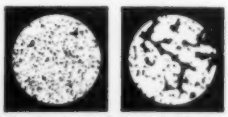
BEARIUM METAL



Words cannot describe the advantages and the superiority which BEARIUM METAL offers over all other types of bearing materials. Only when you use it under the most difficult operating conditions can you appreciate its amazing superiority.

So, if you have a bearing application which involves high speeds, poor lubrication, excessive loads, elevated temperatures, dusty and gritty surroundings—or where a liquid other than oil must be used as a lubricant . . . BEARIUM METAL will prove to be your best investment.

THE SECRET OF BEARIUM METAL'S superiority is due to the uniform distribution of microscopic lead particles within the copper-tin grains rather than between the grain boundaries—as illustrated by these two photomicrographs.



*Bearium Metal* *Ord. Leaded Bronze*

FEATURES: Non-Seizing and Non-Scoring • Long-Wearing • Self-Lubricating • Low Coefficient of Friction • High Compressive Strength • Resistant to Shock Loads • Sound, uniform structure • Free Cutting.

AVAILABLE IN: cored and solid bars • centerless-ground rods • machined parts • pattern castings.

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PACIFIC PALISADES, CALIF.
In Canada:
BEARIUM METALS OF CANADA, LTD.
RICHMOND HILL, ONT.

Circle **6** on Reader Service Card

### Induction motors

A line of 400-cycle induction motors for use in aircraft and similar 400-cycle applications have ratings up through the NEMA 215 frame size. Frame and end-shields are

heat-treated anodized aluminum. Typical motor shown is 12.5 hp with full load speed of 7300 rpm for a weight of less than 25-lb. Frame diameter is less than 6¾ in. Motor illustrated is made with an internal spline for a close-coupled connection to a hydraulic pump. This type also comes with standard or special shafts in any modification.

*Doerr Electric Corp., Cedarburg, Wis.*

Circle **213** on Reader Service Card

### Relay for fhp motor control

A line of relays for control of small, self-protected electric motors up to ¾ horsepower, may also be used with other power devices such as horns, buzzers, lights, electronic equipment, solenoids and valves. Called the CR120E, relays are rated at 600 volts for 6, 12, 24, 115, 230, 440, and 550 volt coils, 60 or 50 cycles. Single pole, closed-contact types are adaptable for use as the start-winding cut-out function on capacitor start motors up to 3 hp at 115 volts or 5 horsepower at 230 volts. Also available in NEMA Type 1 enclosure.

*General Electric Co., Schenectady, N. Y.*

Circle **214** on Reader Service Card

### Partial motors

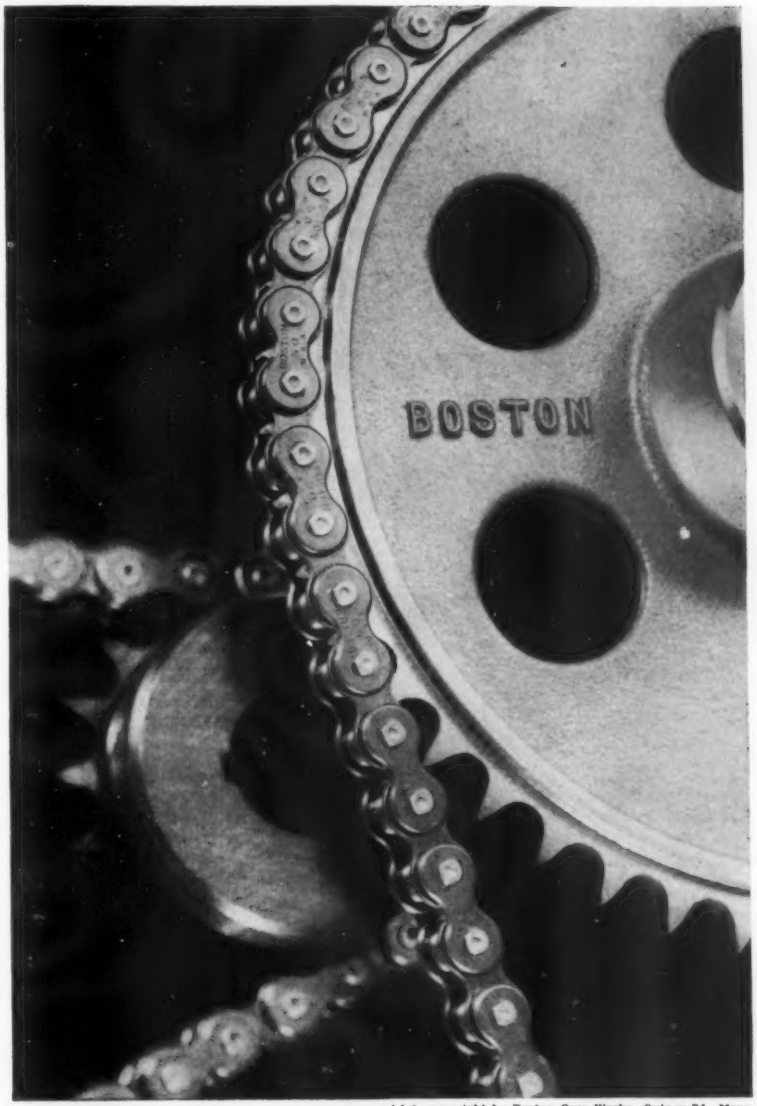
Partial motors are said to cost 10 to 35% less than a complete motor, and often operate better with the machine they drive through elimination of frames, end-brackets, shafts and other parts. Partial-design modifications of company line from 1/40 to 300 hp.

*Howell Electric Motors, Inc., Detroit, Mich.*

Circle **215** on Reader Service Card


**BOSTON Gear® QUALITY**

sprockets and chain




Advt. copyright by Boston Gear Works, Quincy 71, Mass.

1488 types and sizes. From local stock.
Off the shelf - at factory prices.
For any chain drive 1/4″ to 2″ pitch -
Roller, Block, Ladder. See Catalog 57.
Design around the quality leader.

**BOSTON Gear®**

IN STOCK at your nearby DISTRIBUTOR

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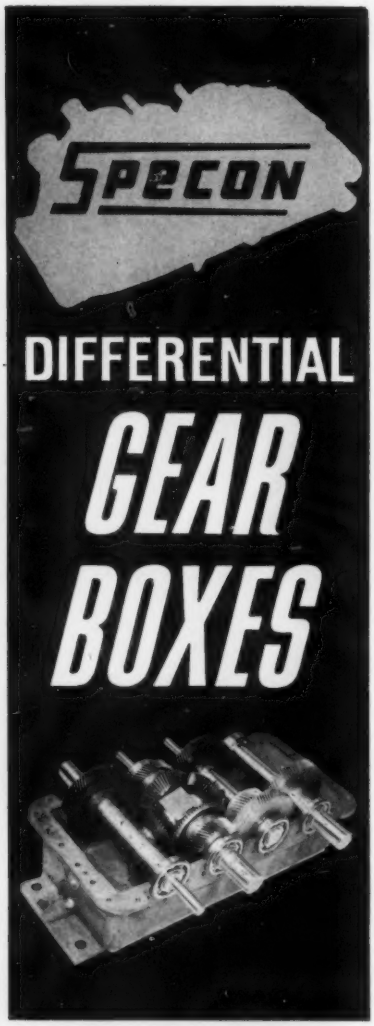


Differential assemblies precision crafted by Specon for drives and transmissions are available as gear boxes alone. These task-proven assemblies offer the built-in advantages of Specon units: extreme accuracy, low maintenance, rugged, space saving construction. Seven basic models are rated from 1 hp. to 75 hp. Specials and units for higher power can be supplied. The Specon units are particularly well suited for such applications as phase and register control, speed control, torque dividing, overriding, cycling and balancing operations.

For full information on Specon gear boxes, drives and transmissions, write to:

**STRATOS®**

A DIVISION OF FAIRCHILD ENGINE AND AIRPLANE CORPORATION
Industrial Products Branch
Route 109, West Babylon, L. I., New York

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# LITERATURE

## on drives and components

**To get free copies of the following literature, use the Reader Service Cards bound into this issue.**

### *Flexible coupling catalog*

Catalog No. 61, Section A, 22-pages, deals with Type L (standard duty, one-piece spider cushion); Type C (medium-heavy duty, individual load cushions); Type H (heavy duty, individual load cushions); Type CF (flange mounted, individual load cushions); Type RRL (radially-removable one piece spider cushion); Type LD (brake drum, one piece spider cushion) and others. Includes load conversion table, hp to torque conversion table and standard key ways and engineering formulas. A section covering special and custom designs. *Lovejoy Flexible Coupling Co., Chicago, Ill.*

Circle **300** on Reader Service Card

### *Oilless bearing catalog*

The Arguto-MP is a self-lubricating, metal-plastic bearing, with high speed and load capacity, that can operate in temperatures of −270 to 375 F without impairing lubrication properties. Stock Catalog No. 511 lists complete line of standard size cylindrical and standard flange bearings made of this material, including all ASTM specifications. Tables of dimensional tolerances, recommended press fits and information on running clearances and machining. *Arguto Oilless Bearing Co., Philadelphia, Pa.*

Circle **301** on Reader Service Card

### *AC load monitoring device*

The Torquetrol is an ac load monitoring device which responds to actual power. It will detect small motor load changes in a machine down to a fraction of 1%. Unit monitors torque which is directly proportional to power. Has heavy-duty output relay. Will detect underload or overload. Bulletin 5109 gives details. *The Clark Controller Co., Cleveland, Ohio.*

Circle **302** on Reader Service Card

### *Instrument measurement bulletin*

GEA-7013, 4-pages, illustrated, describes new electrical-physical measurement service facilities available at the Schenectady Instrumentation Service Department. Bulletin discusses solution of measurement problems involving complex equipment, technical manpower and typical and unusual measurement applications. *General Electric Co., Schenectady, N. Y.*

Circle **303** on Reader Service Card

### *Redesigned pressure indicator*

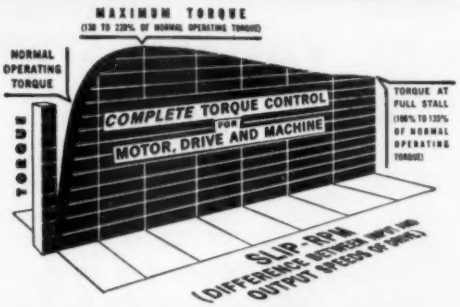
Redesigned Teledyne Model 236 pressure indicator is described and illustrated in Data Sheet P-60236. Designed for the remote indication of gas pressure, fluid pressure thrust, and torque, Model 236 is shown in typical arrangement with a strain-gage pressure transducer. Panel-mounting information, adjustment and calibration procedures, specifications and prices are included. *Taber Instrument Corp., North Tonawanda, N. Y.*

Circle **304** on Reader Service Card

### *V-belt clutch catalog*

Illustrated 16-page Catalog 40 covers the complete line of Ball-Lok standard, custom and advanced design lever action clutches (unitized pulley-and-clutch type).

Circle **45** on Reader Service Card




**Add this *Safe* controlling device to *your* equipment with GLEASON-TORMAG® Magnetic DRIVES**

It's the best way to prevent motor burnouts, broken machine parts, product spoilage, production downtime . . . GLEASON-TORMAG Drives with permanent magnets give you a "cushion" on every installation that will minimize overload shocks, reduce heavy starting loads, prevent damage from jams and stalls, and permit motor operation without over-heating and damage. No fluids, particles, seals, brushes, or exciters to require maintenance.

Add this protection *now* — write on your company letterhead for new catalog TP260 and engineering suggestions.

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*clip this ad to your letterhead!*

PTD-41

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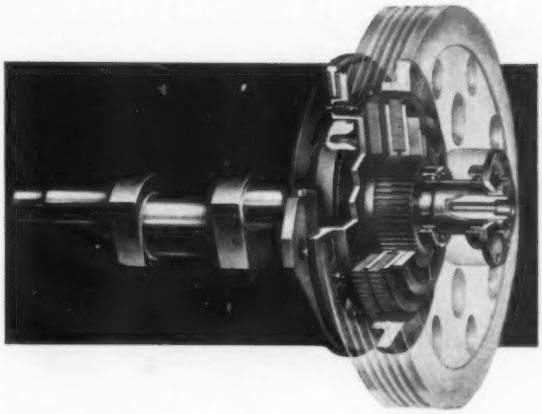
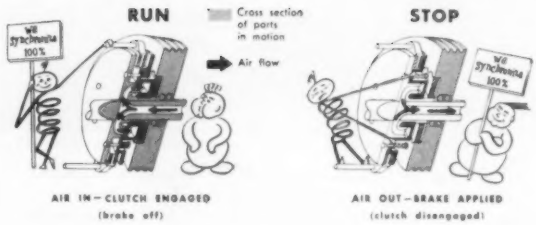
# To Increase Press Efficiency






## MINSTER Clutches for Press Conversions

A Minster Clutch conversion is the most profitable way to increase press efficiency because it will

- eliminate downtime caused by clutch failure
- reduce maintenance and parts replacement
- increase die life
- reduce operator fatigue
- improve safety and increase production

Minster conversion units, *made by a press manufacturer who knows your problems*, are standard clutches individually applied to your press. Complete with flywheel and shaft, ready to drop into place. Thousands in daily use.

*Write for Clutch Conversion Booklet CC57*

**THE MINSTER MACHINE COMPANY • MINSTER, OHIO**

# MINSTER®

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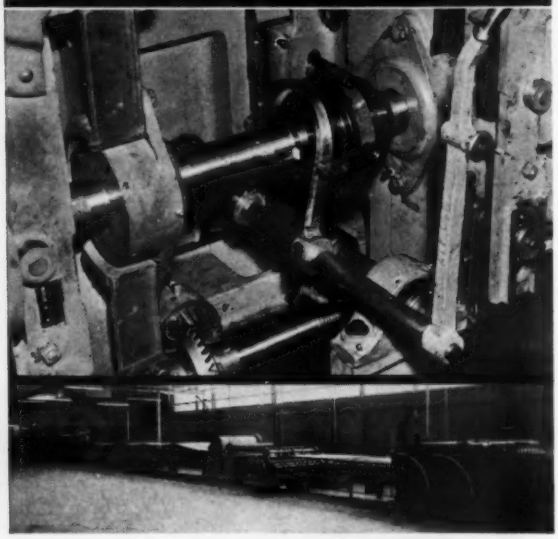
# "Cut-Out" Coupling saves WEAR & TEAR On Rotary "Cut-Off"



A special Sier-Bath "Cut-Out" flexible gear coupling installed on a Langston Rotary Cut-Off saves wear and tear on the drive and cycle mechanisms on the second station when it's not in use.

The Samuel M. Langston Company of Camden, N. J., manufacturers of paper-making machinery since 1901 have used Sier-Bath flexible gear couplings for many years. In this latest application, Langston uses a special "Cut-Out" coupling between two stations of their Rotary Cut-Off so that by the simple disengagement of the coupling, the second station becomes inoperative. This is done when only one sheet length is required and when this length can be adequately handled by the first cut-off knife.

This is a typical application for the "Cut-Out" coupling and Sier-Bath has specialized many such units for multi-color printing presses, electric motor and engine driven pumps, test equipment; in fact, any units which may require the emergency cut-out of driven equipment or when power input has to be alternated between two driven members.

"Cut-Out" couplings are made in all sizes with standard hubs. Sleeve design is custom made to fit the requirements of the specific application.

For your next unusual coupling requirement remember that Sier-Bath is a "specialist in specials" and . . .

*Write for your engineering catalog today!*

**Sier-Bath**
GEAR AND PUMP CO., INC.
*FLEXIBLE COUPLING DIVISION*
9252 HUDSON BLVD., NORTH BERGEN, N. J.

Member A.G.M.A.
Founded 1905

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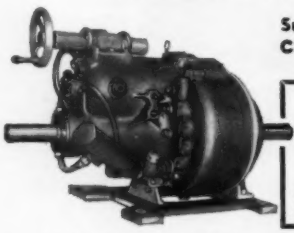
# 10 HP. VARIABLE SPEED

**0-to-1600 RPM**
**HYDRAULIC TRANSMISSION**



**Suitable for any 2 to 10 HP Continuous Duty Application**

Save Thousands of $$$$
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Modernize your existing machinery . . . here's low cost automation for HIGH-TORQUE, HEAVY DUTY applications as:

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Drive at 1800 RPM or less with any 2 to 10 HP motor or 20 HP gas engine for variable speed from 0 to 1600 RPM. Continuous Duty! Precise speed selection is obtained by rotation of hand wheel giving infinite number of speeds. Speed is smooth and constant. Neutral off position. Controls easily altered for remote control. Ball and Roller bearings throughout. Extremely compact and light: 100 lbs., size 22" L (excl. shafts), 13" W, 16" H. Input shaft 1⅜" dia., 4" L. Output shaft 1⅝" dia. 4" L. The precision and skill that went into the manufacture of this unit are beyond compare. Complete instruction and service manual.

**ORDER DIRECT FROM THIS AD**

We will accept your purchase order "subject to return" if unsuitable in any way—for full credit or refund of purchase price!

***Supply Limited! Don't Wait! Phone TAylor 9-1365***

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# WHAT'S YOUR PROBLEM?

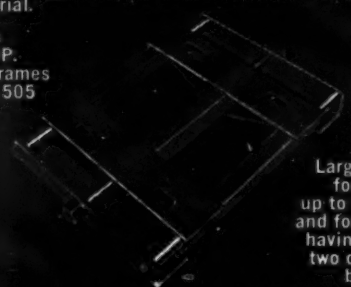
*Is it any of the following?*

- Diminishing output due to a progressive drop in rpm.
- Too much down-time because of the need for frequent adjustment due to belt stretch.
- Excessive maintenance time and expense.
- Poor belt and bearing life.
- A drive in an inaccessible or isolated location.
- A high-ratio short-center drive.

MOUNTING THE MOTOR ON AN "AUTOMATIC" BASE MAY PROVE TO BE A SIMPLE AND ECONOMICAL SOLUTION

Motor mounting position and direction of pulley rotation are immaterial.

Stock Sizes
⅛ to 125 HP.
for NEMA frames
56 through 505
and 445-U



Larger Sizes
for motors
up to 500 HP.
and for motors
having one or
two outboard
bearings.

**AUTOMATIC MOTOR BASE CO.**
WINDSOR, N. J.

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## LITERATURE

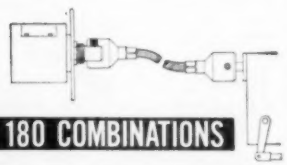
Emphasis is on selecting the proper clutch for the job, with a choice of general purpose, heavy duty, ball bearing and special clutches. Includes optional shaft requirements, pulley sizes and actuating devices, as well as price and application data. Offers a number of new clutch designs such as Duplex types for 2-speed drives, Vari-Speed non-locking models and clutches for the ¾ in. high capacity belt. *V-Belt Clutch Co., Los Angeles, Calif.*

Circle **305** on Reader Service Card

### *Gear inspection machines*

Describes and illustrates Model GRF automatic gear checkers and classifiers, Models GRJ and GRH simplified gear rolling fixtures that include optional low-cost chart recorders. Model GSC gear speeders equipped with electronic noise indicators and a precision involute profile checking machine for gear shaving cutters. *National Broach and Machine Co., Detroit, Mich.*

Circle **306** on Reader Service Card

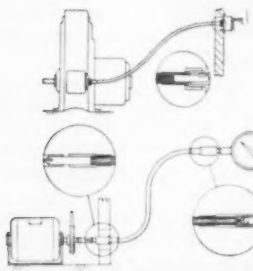



**OVER 180 COMBINATIONS**

CIRCLE ESS STANDARD FLEXIBLE SHAFT ASSEMBLIES are versatile enough to fill the demands of many different applications and yet offer the advantages of economy in time and money.

They are composed of stock components, the finest steel cable, vinyl covered steel casing and cadmium plated coupling type steel end fittings.

We Solicit your inquiry on Circle Ess Flexible Shafting.



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# Quality Clutches Exclusively

These **Over-Center Clutches** are General Purpose, heavy duty, friction clutches for machines requiring high quality dependable clutches with low power losses, low upkeep, and long life. Built in *Flex-Disc,* Solid Disc (two halves), and Gear Tooth types.

Five sets of over-center toggles provide two to three times greater bearing surface. Easily adjusted for wear by releasing latch and turning toggle assembly.

*We offer a complete Clutch Engineering and Manufacturing Service — designing, producing, and applying clutches to meet any conditions arising in industry.*

**INDUSTRIAL CLUTCH CORP.**

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# WHEN YOU NEED HELP IN A HURRY–

## Koppers coupling service cuts costly down-time

Not every coupling service need is an emergency. But it's the emergencies that really test a good organization. That's why Koppers maintains experienced field engineers and outstanding stock facilities throughout the country. In addition, if it's a Fast's Coupling you're replacing, we have a serial number and specific application history for every Fast's for easy reordering. And our modern manufacturing facilities have the extra capacity to lick an emergency for special requirements.

*Example:* A modern windowless bank in Georgia was able to open for business as usual only because Koppers flew in a completed replacement coupling for its air conditioning unit. Elapsed time . . . request phoned to Baltimore after 10 in the evening . . . coupling arrived before 7:30 next morning.

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KOPPERS

**FAST'S COUPLINGS**

Engineered Products Sold with Service

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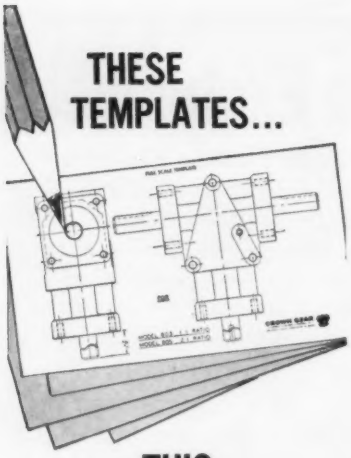
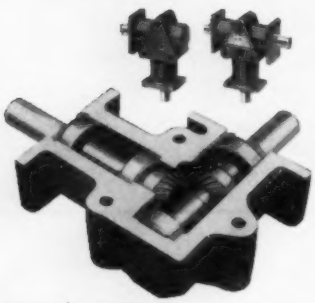


THESE TEMPLATES...

THIS CROWN "PACKAGE"



wrap up your right-angle design problem!

. . . And the transition to the "Package" concept of right-angle power transfer is that simple with this easy-reference template kit. 18 basic Crown right-angle units are shown on six template sheets, each full scale.

WHY spend countless hours on research and drawings? WHY purchase expensive patterns, core boxes, castings, steel and other materials? WHY manufacture fixtures and gages? WHY machine, inspect, assemble and test components?

WHY NOT OBTAIN THE IDEAL SOLUTION TO YOUR RIGHT-ANGLE PROBLEM . . . IMMEDIATELY, AND AT TREMENDOUS SAVINGS?

Your local Crown Gear Distributor (Listed in Power Transmission Design Directory) has the answers . . . and your Template Kit. Call him or consult factory.

CROWN GEAR

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A Division of Harrington & Richardson, Inc.

Circle **14** on Reader Service Card


# MEN

**of the power transmission field**

### New applications engineer at Formsprag

*Kirkhoff*

James R. Kirkhoff, New York, is application engineer for the line of centrifugal clutches and clutch-couplings manufactured by the Formsprag Company, Warren (Detroit), Mich.

Kirkhoff, associated for the past three and one-half years with the Chrysler Corporation, Highland Park, first as an engineer-in-training and subsequently as a gas turbine analyst, holds a Bachelor of Science degree in mechanical engineering from Indiana Technical College, Fort Wayne, Indiana. He earned his M. S. degree at Chrysler Institute of Engineering in automotive engineering two years later.

### Appoint new product manager

John R. Jones, appointed new product development manager for the Alpha-Molykote Corp., will be responsible for development of new lubricants for more effective boundry lubrication.

Jones joins Alpha-Molykote from the Boeing Airplane Company where he has been materials engineer in charge of fuels, lubricants and hydraulic fluids in the Transport Division. Recently, for Boeing, he has been coordinating the study of friction in a vacuum being conducted by the Franklin Institute. Jones' 13 years experience in the lubrication field also includes employment with Douglas Aircraft Co. and the Esso Standard Oil Co. He holds many patents in the lubricant and lube oil additive fields.

Active in technical society affairs, Jones is a member of the Coordinating Research Council, and has served on various committees of the ASTM and ARTC. He was leader of the G.R.C. panel on Service Evaluation of Ball and Roller Bearings, and is now a member of the C.R.C. panel on Bonded Solid Film Lubricants.

### T. B. Wood's appoint sales engineer

Robert T. Tondreau, has joined T. B. Wood's Sons Co., Chambersburg, Pa., as field sales engineer, Pittsburgh territory. He was formerly associated with Boston Pulley and Shafting Co., Cambridge, Mass. Recently he was responsible for T. B. Wood's Cambridge warehouse.

### New advertising manager at Link-Belt

*Wendell*

Erwin A. Wendell has been appointed manager of advertising and public relations for Link-Belt Company, with headquarters at the company's executive offices in Chicago.

The appointment follows the retirement of Bertram V. Jones, advertising manager for the past ten years and a member of the advertising department since 1923.

Wendell joined the company's engineering department at the Pershing Road plant in Chicago in 1917. He entered the sales department in 1921, serving in the Chicago territory until 1937. After holding positions in St. Louis and again in Chicago he joined the

executive sales division at the executive offices in 1953, in market research and sales analysis. He was named assistant advertising manager in August.

### Two promotions at Garlock

Garlock Inc., Palmyra, New York, has announced the promotion of two men to new positions, following the retirement of New York district manager, Alfred E. Munch.

Named to succeed Munch as New York district manager was John Durham, who since 1959 has been manager of the Mechanical Packing Company's Denver sales district.

Also promoted was Neal Monger who became the Denver district manager. He previously was a sales representative for Garlock in the Western Michigan territory.

### Quality control manager for Whitney Chain

Whitney

Donal R. Whitney is the new quality control manager for The Whitney Chain Company, Hartford, Conn., subsidiary of Foote Bros. Gear and Machine Corporation.

For the past three years Whitney has been engaged in quality control work in the manufacture of nuclear reactors at Combustion Engineering, Inc., Windsor, Conn. Prior to that he was employed in quality control work at Whitney Chain. In his new position he will be responsible for the direction of the company's product quality program.

### Dayton Industrial names district manager

Robert J. Poffenbarger, named district manager for the Dayton Industrial Products Company, will be responsible for industrial V-Belt sales throughout the North Carolina area. He will work from Charlotte.

A native of Chicago, he attended Tri-State College in Angola, Indiana, and the University of Detroit.

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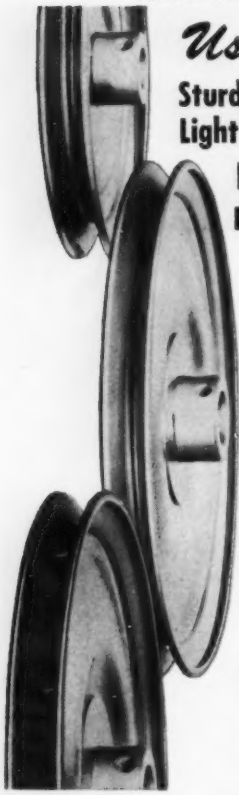


*Use*

**Sturdy, Smooth Running, Light Weight**

**NAGEL-CHASE FHP V-Belt Pulleys!**

Let specialists make your V-Belt pulleys and take a load off your production facilities while they cut production costs.

Nagel-Chase pulleys have been used for power transmission on compressors, washers, dryers, lawn mowers, tractors, agricultural equipment and similar applications for many years.

This company has the specialized experience and facilities to produce these pulleys promptly and economically. If your specifications call for a standard size pulley with a pitch diameter from 2.4" to 12.625" for which tools are already available, further savings can be effected.

If there's a sheave in your product —consult Nagel-Chase.

*Write for Catalog—Circular*

*The* **NAGEL-CHASE MFG. CO.**

2815 No. Ashland Ave.
Chicago 13, Ill.

**Couplings for Power Transmission**

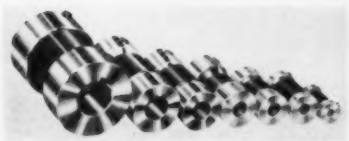
***Gear-Grip . . .***

**The most revolutionary Flexible Coupling Design Development in a century!**

Actual Size New S-G Coupling

- New available for subfractional, fractional and integral H. P.
- Ability of rubber Flex-Elements to float between captive end fittings distributing load similar to universal joint action.
- Load Ranges—1/12 H.P. through 30 H.P.
- Shaft Sizes—⅛ through 1⅞.
- Specified exact length to design requirements per series.
- Prevention of end thrust among many other design advancements.*

***Dyna-Line*** The finest flexible coupling in single unit construction—specifically designed for fractional H.P.



- Lengths varied to design specifications in each series.

5R 4R 3R 2R 1R 0R 00R

- True Flexibility and Torsional Resilience for quiet, load-plus power transmission without extreme deflection or twist.
- Load ranges—1/15 to 1½ H.P.
- Shaft sizes—3/16" to ¾".
- Lowest O.D. for highest torque capacity.

*Write for Catalogs and Technical Bulletins.*

**GUARDIAN PRODUCTS CORP.** Dept. PT-461 1218 E. SECOND ST. MICHIGAN CITY, IND.

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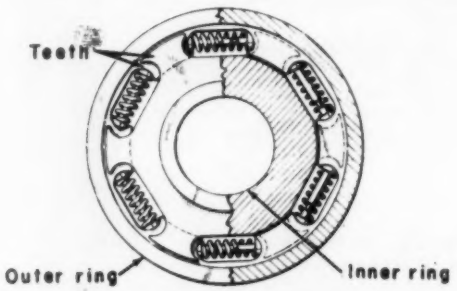
# PATENTS

## Elastic coupling

*U. S. Patent No. 2,895,316; Jan Kloud, Holyne, Czechoslovakia, assignor to Vyzkumny a zkusebni letecky ustav, Letnany, Czechoslovakia.*

An outer ring transmits torque to (or from) an inner ring through an elastic coupling. The outer ring has

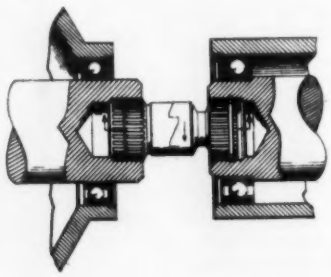



teeth on its inner circumference that mate, through springs, with teeth on the outer circumference of the inner ring. The springs are not all of the same lengths, so that increased torque causes more springs to be used in the torque transmittal.

## Reversible shear output shaft

*U. S. Patent No. 2,964,931; Kal K. Sorenson, Phoenix, Ariz., assignor to The Garrett Corp., Los Angeles.*

A shaft coupling for transmitting torque in one direction from a driving shaft to a driven shaft, that will fail under a predetermined load. When the driven



shaft tends to transmit greater than a given torque to the driving shaft, axial separation is permitted to occur by failure of an axial restraining element. When greater than another given torque is applied to the driving shaft, the connection between driver and driven shafts fails.

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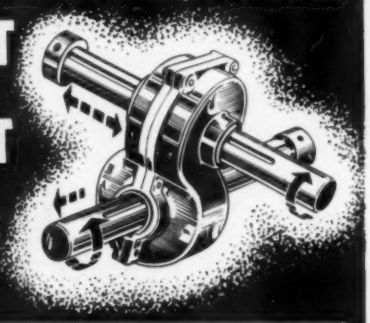

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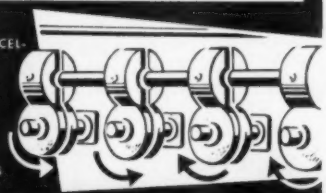

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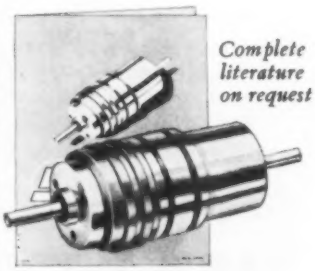

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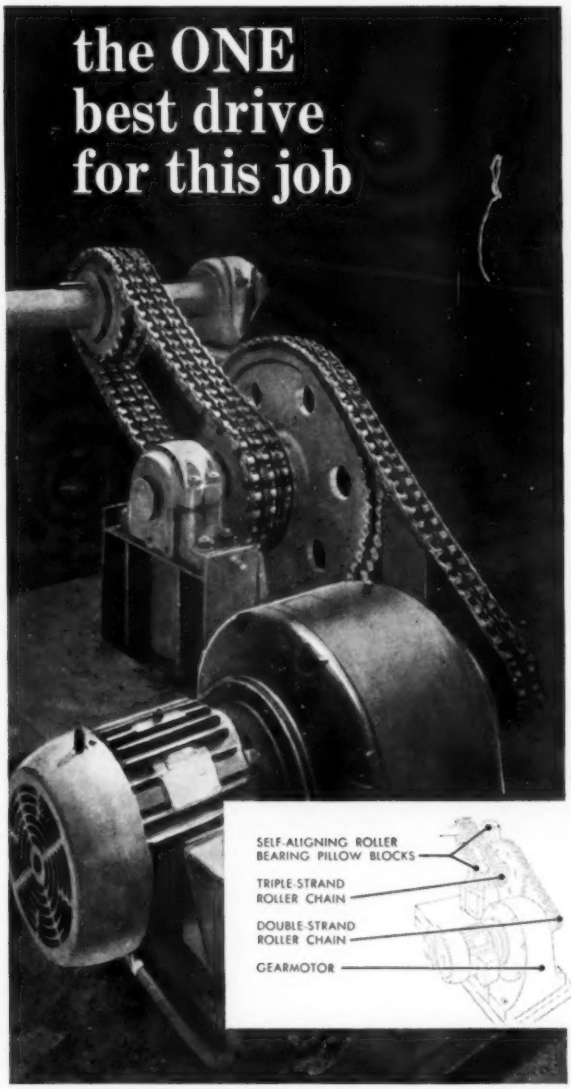


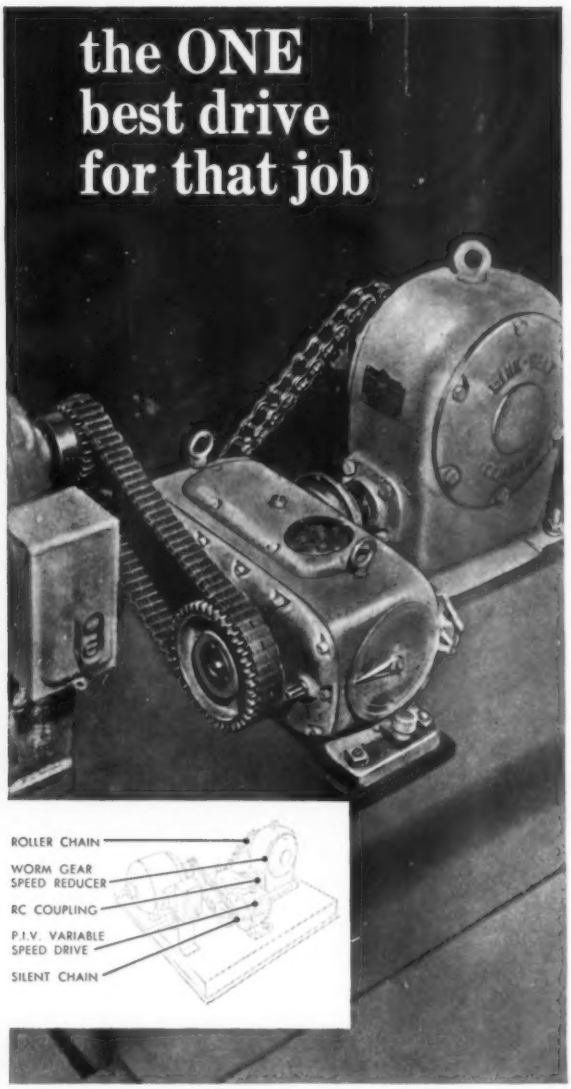


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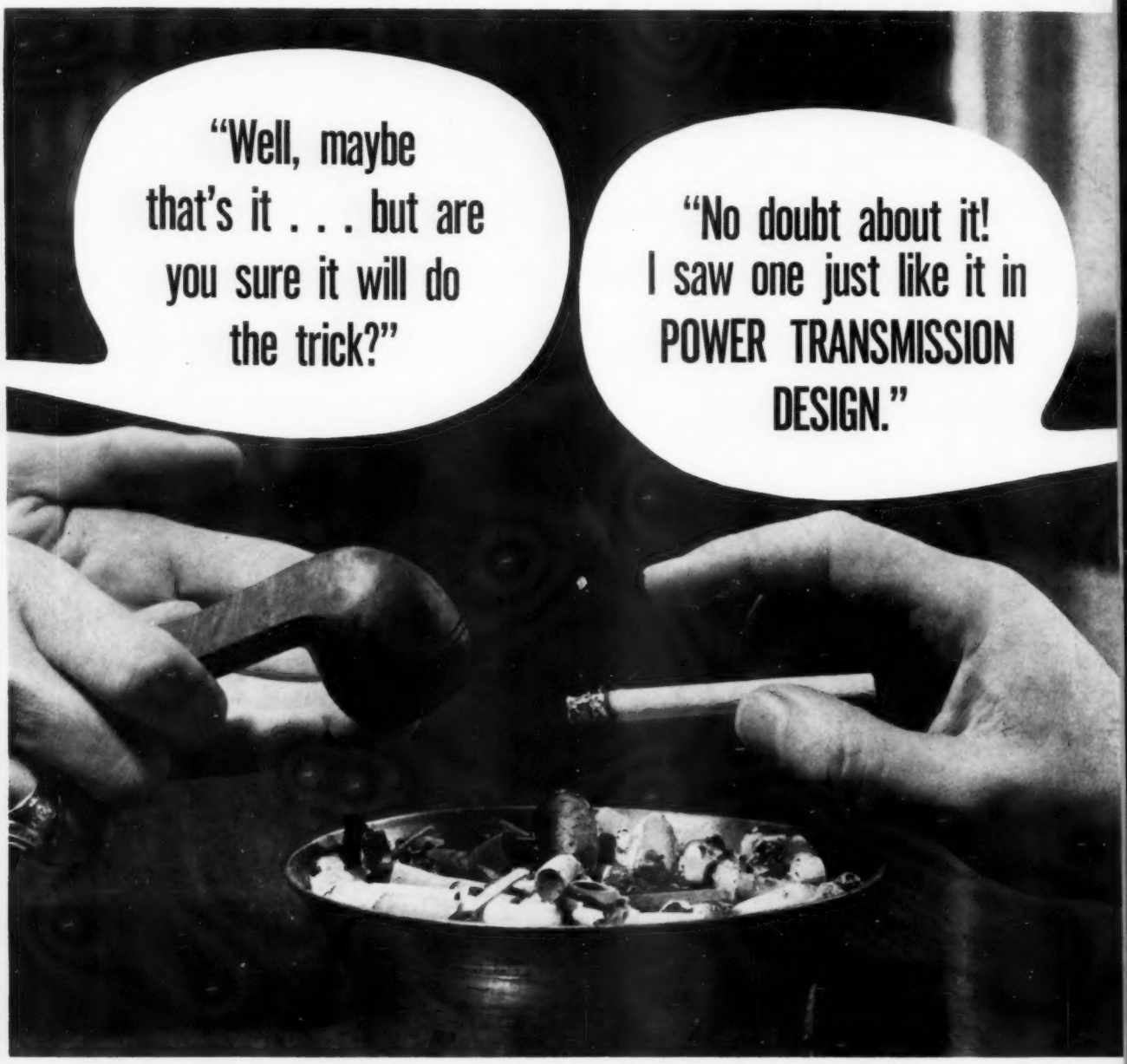
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